On NETWORKING

June 26, 1987

PRODUCT FILE

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compiled by Gillian Sidebottom

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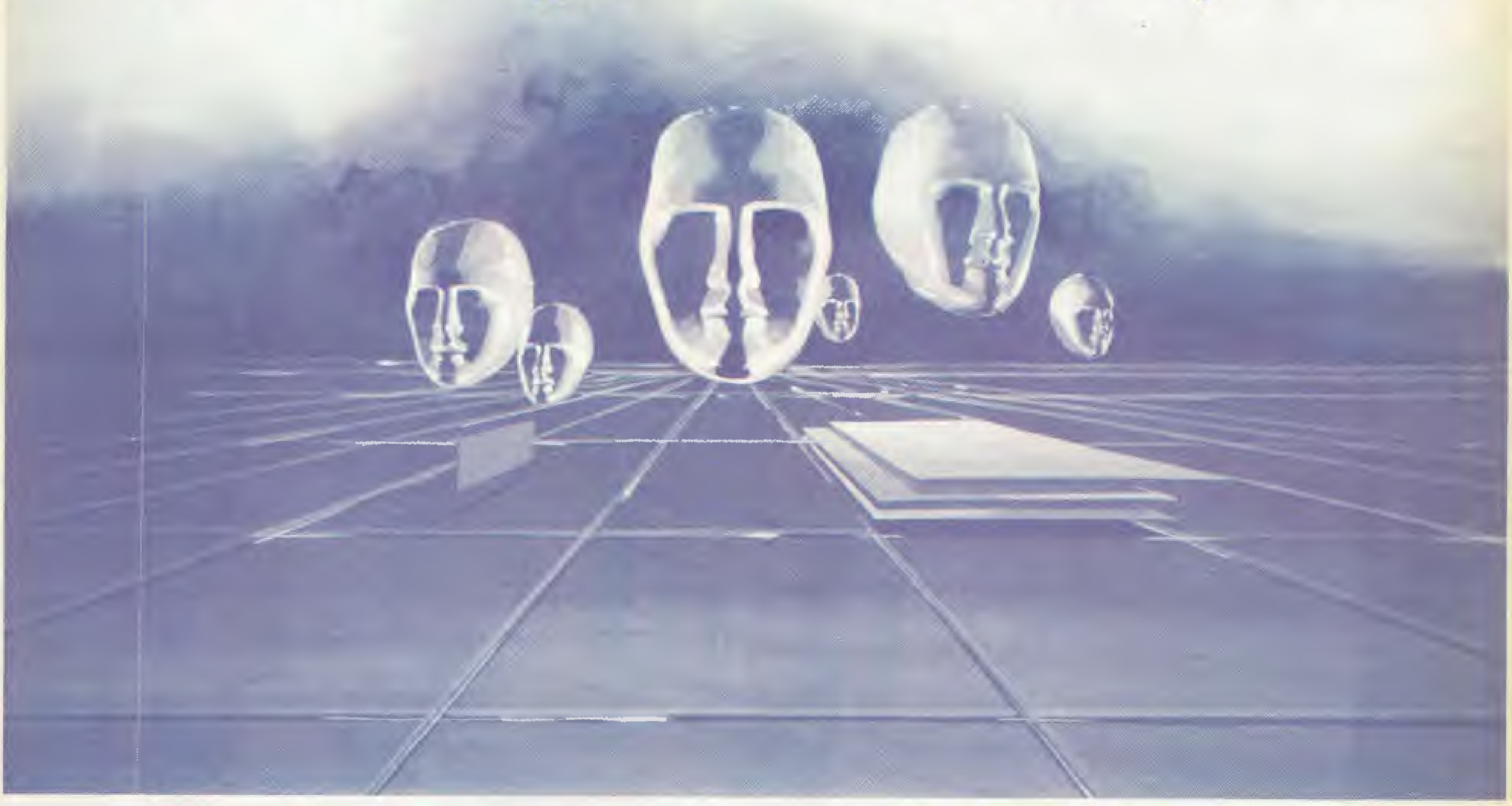

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Cutting through the layers of connectivity

Dianne Hill looks at how the major players are making technological advances in networks.

TRADITIONALLY, Lans (local area networks) have been associated with smaller areas such as a building or groups of buildings whereas Wans (wide areas networks) are synonymous with a wider geographical area.

Developments now enable a number of technologies to co-exist, whether Token Ring, Ethernet or some other technology by the use of bridges (enabling linking of two Lans of the same type) and gateways (allowing protocol conversion between a Lan and a network of a different type, being a foreign Lan or a long-haul architecture such as SNA or X.25).

As well as all the permutations of broad band and base band connections being available, bridges from Ethernet networks to Token Rings have appeared since the introduction of the IBM Token Ring network.

The number of technologies available and practical combination of those technologies can create both opportunity and confusion to the purchaser.

To compound this, there has been the proliferation of PCs acquired by organisations that are not necessarily compatible with each other or with other equipment in the organisation, so that equipment is not fully used. This growth in PCs has led to duplication (and sometimes PCs inconsistencies) of databases, file backups and the like, hindering productivity and duplicating costs.

It is estimated that less than 20 per cent of PCs are used to maximum advantage in being linked into the corporate database. Admittedly the technology to maximise use was not originally available, but a number of vendors are now able to improve this.

It has been in the users' interest to seek compatibility of communications, and organisations such as COS (Corporation for Open Systems), whose members comprise equipment vendors and users, have been formed to speed up the development of standards and conformance testing. As the industry moves towards co-existence, the requirements for these standards has become crucial.

	7	Application
	6	Presentation
	5	Session
	4	Transport
	3	Network
	2	Data Link
Layer	1	Physical

■ ***The seven layers of OSI***

The seven layer ISO model (International Standards Organisation) has been adopted by most vendors.

The first two layers — Physical and Data Link — enable devices to connect to a physical medium and to send and receive data over the channel. The upper layers are critical to the interpretation of data — they receive and interpret data so that the user understands the information. This is particularly important when equipment from different vendors is connected to the Lan as it enables the differing computers to be on the same Lan and exchange information, all transparent to the user.

The Lan primarily utilises the lower 2-3 layers, but networking takes on a broader perspective in view of international standards. One vendor participating in these international standards bodies is Wang which was a founding member of OSIcom and the ISDN development forum. Wang participates in others such as COS, OSI-net/Eurosinet (Europe), OSIcom (Australia, formed by Csiro) and the Australian ISDN Developers Forum.

Honeywell designed the original model on which the OSI standards are based as is also a founder of COS. The company has an OSIride network in Europe which connects major Italian university centres with minis and mainframes from Honeywell Bull, DEC, Olivetti and IBM. Managing director, John McKim, stated that "Honeywell Bull is a member of OSInet

(Continued page 4)

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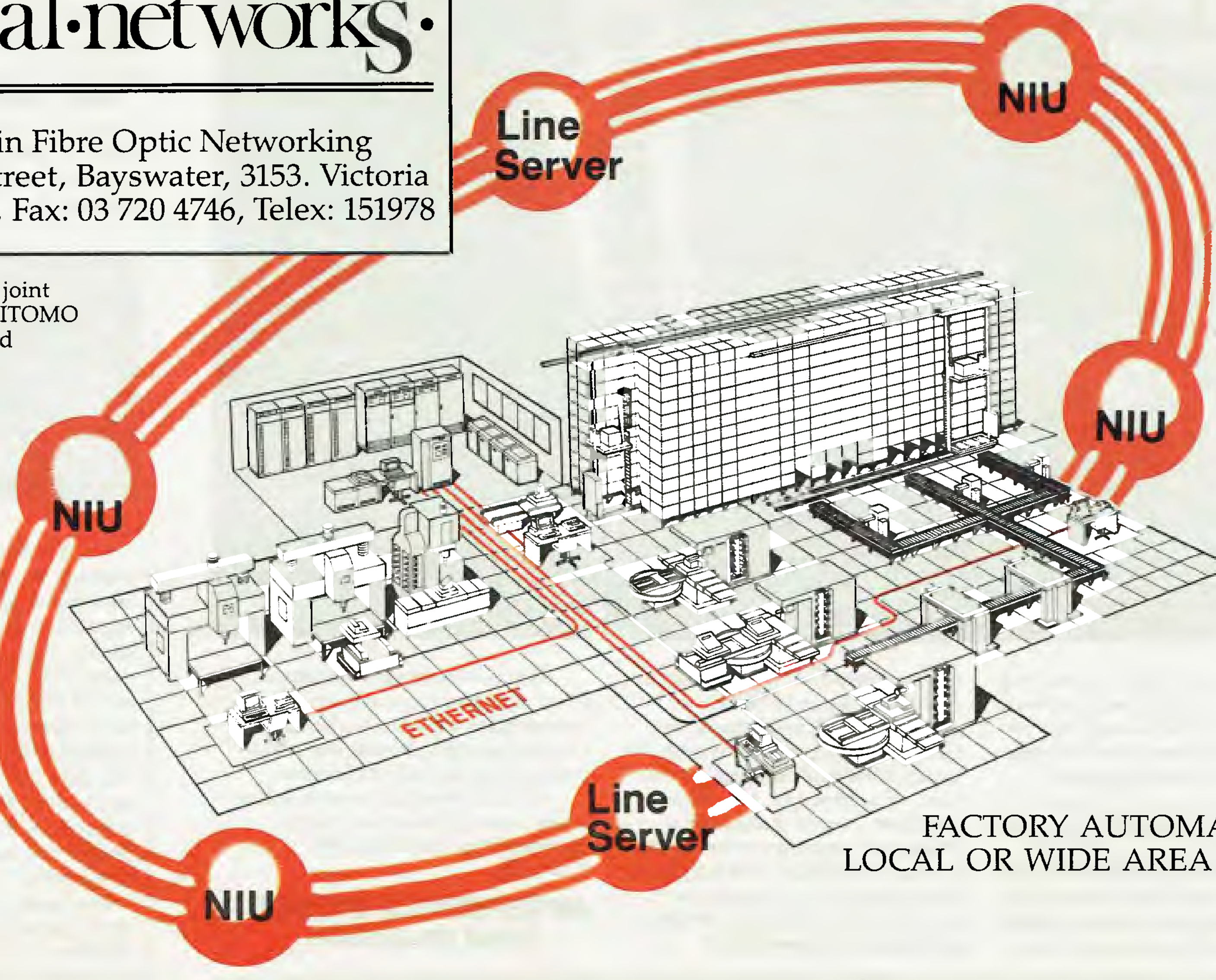

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Fibre optics will be

■ ***John McKim of Honeywell Bull . . . original OSI model.***

(Continued from page 3)

and in the middle of last year participated in Eurosinet, the world's first OSI demonstration over a wide area network".

DEC also lends its support to these international standards and has a genuine commitment to "drag the industry along," as a spokesman phrased it. They have products available to layer five and are participating in a joint learning/expertise venture with Csiro in Australia on X.400. X.400 is an application-level (7th layer) example of a standard conforming to the OSI model of ISO. It is DEC's intention to "lead the world" in the standards race.

IBM worked with the IEEE (Institute for Electrical and Electronics Engineers) in developing the Token Ring. Dick MacMillan (IBM Australia product manager communications) believes that "the Token Ring is the best available today due to its greater capacity to process data". He said the Token Ring could be for voice communications, initially in voice notation to electronic documents. He also believes that the advent of fibre optics will enable building of complex Lans although this is for the future.

There are also opportunities to increase "compute" power at the desk. This will only be realised if PCs are networked from desk to desk with the Lan providing the way, interconnecting to medium sized departmental systems and corporate large systems. IBM has also announced (available at the end of the year) the Enhanced Connectivity Facility which allows the host to format the data and download to the PC for use in a Lotus spreadsheet format. IBM is a member of the ISO committee, a member of OSIcom and is active in the Standards Association of Australia.

In Australia many government tenders, and those from most major organisations, specify commitment and development towards international standards.

Worldwide users are becoming more involved in the development of these standards. General Motors is one such organisation which realised that the cost of maintaining, developing and supporting equipment from a large number of different vendors was excessive.

General Motors formed a study group and developed joint technology-study agreements with vendors such as IBM, DEC, Hewlett-Packard, Honeywell and others. From this arose the Map protocol (Manufacturing Automation Protocol) based on OSI protocols. A Map user group (Mug) was formed which now has more than 200 users in the US. It is expected that standards will be in place by 1988/89. IBM with its Series 1 range has a Map offering today.

A similar effort was made with Top (Technical Office Protocol) which is Maps OA equivalent, although developments in this area are a little behind those of Map. The Top protocol is particularly important to Wang as the products are up to layer three of the ISO model, but with the developments (and participation) in Top, it will be aiming for layer seven.

Although many of these developments are being carried out overseas, they are closely watched by the Australian Computer Vendors affiliates and major organisations and in some instances Australia is the development area.

Wang Australia, in winning a major share of the 1982 Department of Social Security tender (Stratplan), has a full research and development group in Sydney.

> *'Ultimately, the office Lan should reduce the need to circulate paper by distributing instantly to terminals.'*

Wang is concentrating on increasing the productivity of the knowledge worker (a managerial or professional individual as opposed to clerical). Ted Sanderman (marketing manager telecommunications) claims that office costs contribute to 25 per cent of the cost of business and that if the same methods are continued that this will increase to 45 per cent in the 1990s. In the US, industrial productivity rose by 90 per cent in the 1970s, while office productivity only rose by 4 per cent with costs doubling. Sanderman believes this would be similar in Australia.

Productivity has been improved with clerical workers (through WP) and now the objective is to improve that of the knowledge worker. To some extent the proliferation of PCs has helped, but training is now needed for maximum utilisation. With the move towards a multivendor environment, Wang believes the emphasis is shifting from a personal to an organisational level, and that it is well placed to succeed.

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used for future Lans

■ *Frank Wroe of DEC . . . dragging the industry along*

Ninety five per cent of all corporation information is still in paper form, and a study carried out by Wang US showed that only 10 per cent of information in a $25,000 million company is accessible through DP/OA systems. Ultimately, the office Lan should reduce the need to circulate paper by distributing instantly to terminals. In the DP Department, the integrity and compatibility of information are the main issues. The automated office requires timeliness and friendliness.

In Australia DEC has two areas of R&D. One is the CSS division which concentrates on short-term developments (six months), particularly directed towards Australian requirements, although many of their developments have been adopted by corporate. Additionally, they have a division of corporate engineering that is a component of corporate R&D. DEC believes that the network will be regarded as the system, with the mainframe or host being a compute server on the network.

> *‘The days when the central mainframe dominated the information services division budget are diminishing.’*

Michael Matthews, network & communications marketing manager said “Digital defines the concept of a System, characterised by a network of system resources — terminal servers, intelligent printer servers, intelligent disk drives, intelligent gateways, even host servers are now compute servers.

“Our customers look at the way their system interacts with the organisation and they expect flexible yet secure access to all system resources from any part of the organisation. We like to think that the network is the system.”

DEC has just completed a Roadshow throughout Australia and New Zealand to educate customers on the way to obtain the best from their PCs.

For Honeywell Bull, “In Australia, our most recent success was our selection by Telecom to fill the first equipment order for Tran$end — the EFT/POS network service which will be used by the ANZ Bank, among others,” a spokesman said.

Honeywell Bull won the order for 150 network access controllers (Nax). These controllers, to be used for packet switching, are believed to be the first of their kind in Australia and possibly the world. This involved the Australian organisation as well as corporate.

IBM has a software development support centre which works with software developers in providing solutions. They also see ongoing education as part of their role, through user groups, dealer education programs and the Australasian Share Guide. They also have a training program for executives to provide the informatioon on user applications and management of PCs.

And from a user viewpoint?

Maurice Cally (manager office information and management systems, Chase AMP) states: “Today an organisation needs to fully utilise functionality to get maximum return on technological investment.”

Chase AMP is a co-existent site of Wang and IBM. The systems have been integrated to the point where the Wang PC can access all OA, money market and financial information. The Wang PC is also used for sending all telexs. Cally said the Australian operation was the first worldwide to enable the Wang VS to access the IBM System/38 in 1985.

Ian Smith (communications manager — NRMA) said: “The communications system must support the strategic business plans of the corporation. It is important not to direct the business with technology, but awareness of technology is necessary at a senior level to seize upon business opportunties by applying it appropriately.”

Smith believes that communications technology needs to be managed centrally and at a senior level as developments are coming from computer vendors, PABX, terminal, OA vendors or telecommunications authorities and a central body is necessary to evaluate how they fit in with corporate goals. Smith goes on to say “with the convergence of computers and communications, the days where the central mainframe dominated the information services division budget are diminishing. The reality is that the central, most expensive item will become the corporate communications network supporting data, voice, image and text services as a common carrier in an organisation.”

Bridge to bridge, gateway to gateway — this could be regarded as a boat race, with the users being the navigators and the vendors being the helmspersons, each chasing the seventh heaven.

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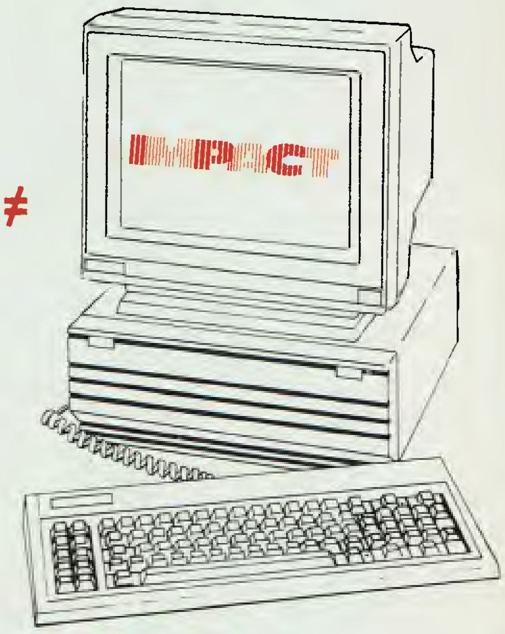

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Get a step ahead of the hackers

Alan Gray says in matters of security, there is no such thing as 100 per cent — it is a constant race between hackers and users

• *Alan Gray is technical director of Data Bridge Electronic Communications Pty Ltd, Ormond, Victoria.*

DOES the dial-back modem really provide protection against determined hackers, or is it simply an expensive way of achieving a false sense of security?

This issue has been raised at several conferences on computer security and had some recent publicity when a major Australian bank conducted tests which revealed that in some cases a telephone adapter and a tape recorder was all that were needed to fool certain modems on the market.

The answer to the question is that it depends on the type used.

A dial-back modem is an "intelligent" device which stores in its memory the telephone numbers and passwords of those users who are allowed into the computer network from the public telephone system.

Once a call is acknowledged by the modem it expects to receive a valid password, to be keyed in by the user within 5 seconds. The modem then simply "hangs up". If the password is not received, or is invalid, the modem takes no further action. However, if the password is valid, the modem waits a predetermined time (typically 5 to 30 seconds), and then dials the telephone number of the password's owner.

Only then is access allowed. In theory, this sounds fine. It would seem that only those telephone numbers stored within the modem have access. But this is based on the assumption that by "hanging up" the modem has disconnected the call — this is not so.

In the Australian public switched telephone network (PSTN), instant disconnection only takes place when the party initiating the call replaces the receiver. If the called party (in this case the modem) hangs up, but the initiator does not, the line will remain open for a period of time determined by the exchange.

This is 90 seconds for AXE exchanges, between 60 and 120 seconds for cross-bar exchanges and, in the case of a step-by-step exchange, as long as six minutes. In all cases, plenty of time for a smart hacker to beat the system.

Having acquired — by whatever means — a valid password, he can access most dial-back modems on the market — all from the comfort of his own telephone.

The method is simplicity itself. After the contact has been made, and the modem has hung up, our hacker simply keeps the phone off the hook — leaving the line open.

With some modems, this may be all he has to do. The modem dials down an already open line — achieving nothing and hey presto! — it is our hacker who answers.

The better modems test that the line is free before dialling by "listening" for the dial tone. This is where the tape recorder comes in.

Password

A high quality recording of a dial tone will fool most modems. Again they dial and get the wrong number — although it is right for the hacker.

Fortunately, there is a solution, although it is believed that the Data Bridge DSP series of modems is the only model to have used it.

Obviously, the problem would be avoided if the modem waited for enough time for the Telecom exchange equipment to disconnect the line before dialling back. But is this 90 seconds, 120 seconds or six minutes?

Another consideration is that with a lengthened time delay, there is an increased probability that a second user makes his initial password call during the time delay period for a previous user. Most modems deal with this by simply "forgetting" about the first call.

The Data Bridge modems get around both these problems with the Time Delay Security (TDS) features: the modem's time delay before dial back can be set by the network manager to any period of time.

The value chosen for a given population of users should be slightly longer than the greatest of the individual users' disconnect times.

Once a user has contacted a Data Bridge dial-back security modem with TDS and supplied his password, he effectively reserves the modem for the time delay period. The modem will not forget him, it will simply not respond to any other call.

A user getting "no reply" from the modem should assume that he has cut across someone else's time delay period.

In matters of security, there is no such thing as 100 per cent. It is a constant race between the technology and ingenuity of users and hackers.

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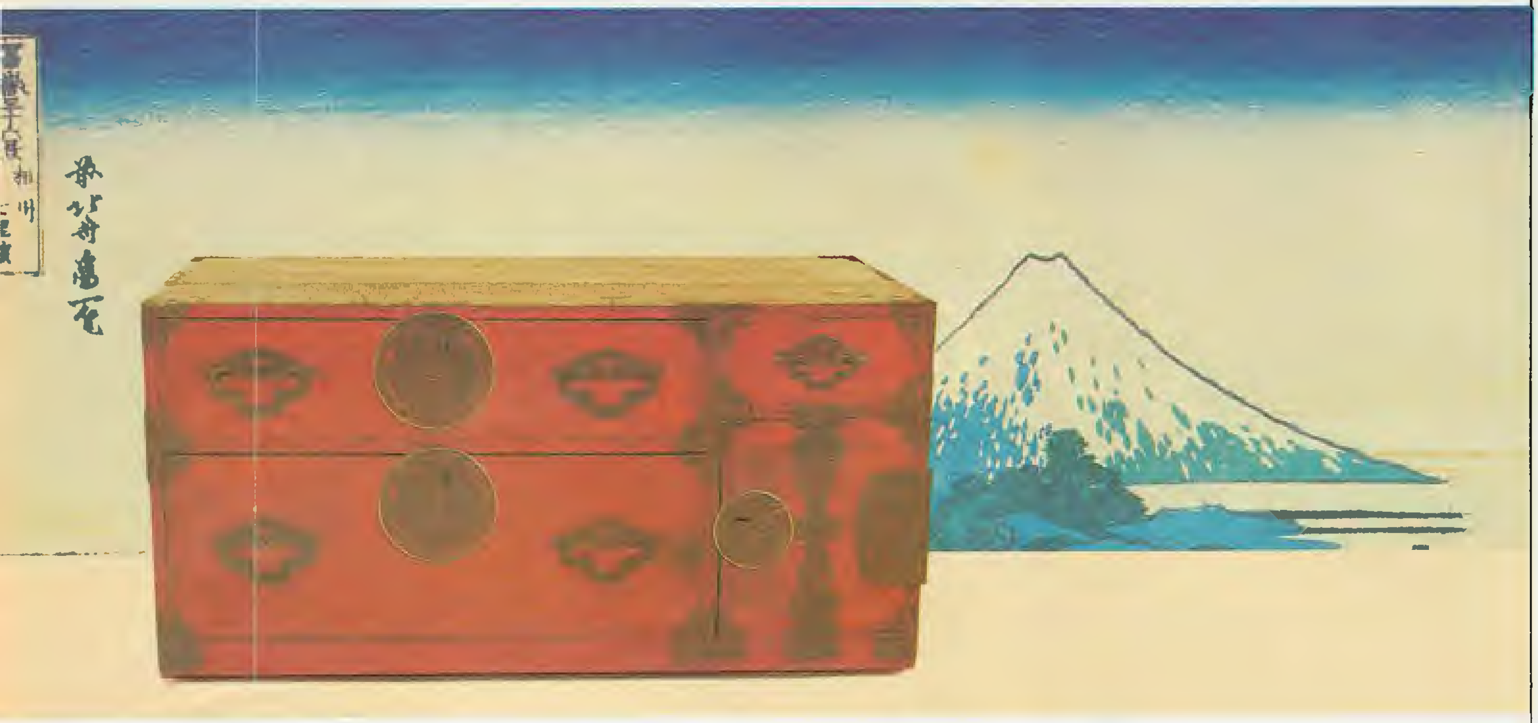

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Linking multiple local area networks has become one of the communications industry's major challenges. Explore internetworking technology, writes Richard Freemantle, in this look at the possibilities.

The bright way to bridge that technology gap

PROBLEMS over linking local area networks have been exacerbated by the conflicting physical media broadband, baseband, coax and fibre-optic used in local area networks and the choice of high level protocols (XNS, TCP/IP, OSI, Decnet). But before solving the problem it is worthwhile exploring internetworking bridge technology.

FUNCTIONS	REPEATER	BRIDGE	ROUTER
ISO Layer	Physical	Data Link	Network
Filter Capability	None	Yes	Not required (*receive internet traffic only*)
Forward Capability	Forward bits	Forward Packets	Forward messages
Forwarding Performance	10M-bits/sec	Thousand pkts per second	Hundreds pkts per second
Addressing Function	No address	Mac addresses	Network address
Ethernet extension	One Physical Lan w/max 2,800m	One logical Lan w/multiple Ethernet	Multiple Logical Lan with unlimited distance
Configuration	Linear topology	Tree type (no loops)	Arbitrary topology
Network Management	None	Yes	Yes
Transparent to upper layer protocol	Yes	Yes	No
Cost	Low	Medium	Medium
Applications	Interconnect Ethernet segments	Localise traffic mixed media	Complex internet

■ *The table compares the various capabilities of repeaters, bridges and routers.*

Internetwork bridges are devices that allow Lans to be interconnected to extend distance Lan-to-Lan interconnection. To understand the ways of interconnection and to understand the internetwork bridges, we need to look at the different layers of the Open Systems Interconnect (OSI) model.

In the model, the first layer is the physical one which defines the rules (such as electrical level and physical characteristics) of communicating across the transmission media. It also specifies the means of joining two cable segments by a repeater which accepts data bits on one side and retransmits them to the other. In the process it allows the original signals to travel a longer distance.

In the Ethernet specification, a single segment is limited to 500 metres. Using repeaters, this can be extended to 1,500 metres (using a maximum of two repeaters according to Version 1 Ethernet), or 2,800 metres (using a maximum of four repeaters, per Version 2/IEEE 802.3). However, the connected segments are one physical Lan and all traffic is present on each segment.

Packets

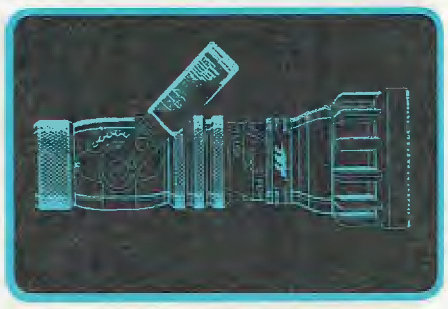
The OSI layer two defines the Data Link in which data bits are grouped as packets. Each packet contains a Source Address and a Destination Address and the rules define the way these packets can access the physical media (Media Access Control or Mac) and how the packets should be treated by upper layer protocols (packet type information and Logical Link Control information). Internetwork bridges operate at this layer to interconnect two physically distinct Lans to form an extended Lan.

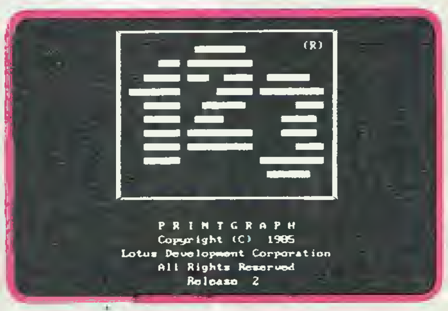
Bridges do not retransmit all traffic like a repeater, but receive all packets on the network. They filter (discard) packets that are destined for the local side and forward (regenerate) only the packets that are destined for the remote side. In this way, bridges route packets based strictly on the Destination Address and do not depend on any routing protocol. Network devices on each side of a bridge simply address the packets to other devices as if they were on the same Lan; they never knowingly communicate with a bridge. Bridges also do not depend on any other protocol beyond the link layer addresses ("protocol independent").

A smart bridge "learns" which devices are on which side by monitoring the Source Addresses. It builds a routing table based on the Source Address and on the corresponding side at which it was received. Thus, whenever a device transmits a packet, its location is detected by the bridge and an entry is made in the routing

(Continued page 10)

FAST PC GRAPHICS





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The great horse palace

IT HAS BEEN described as "a Regent Hotel for horses", "the great horse palace" and "the horse's Hilton".

The new Lord Ben Stables at Rosehill, Sydney, have been under construction for 2½ months and are due for completion towards the end of the year.

This health resort for horses designed by Devine Ervy Mazlin in conjunction with thoroughbred trainer, Geoff Chapman, will comprise 40 boxes, 20 of them with day yards, an equine swimming pool, six motel-style rooms for the staff, an administrative office block and an onsite trainer's home. It will also have a large area of skylight so that the horses can benefit from the natural light.

Controlling this multi-million dollar complex will be a Telesystems' designed PC network. At the request of thoroughbred owner John Denoon, chief executive Carringbush and a major client of the stables, Telesystem's programmers set to work designing a computer system that could process comprehensive details on each horse and cope with the everyday running of the stables.

Comprising seven IBM compatible PCs, two Telesystems and five Coronas, feeding off a dedicated Telesystems' fileserver, the network is at present up and running in its temporary home in the city.

The system provides details of the horses whose home is at Lord Ben Lodge. Race results, breeding details, expenses, training, feed, veterinary histories can all be stored within the system.

The final facility will be set up for 12 IBM compatible PCs feeding off one fileserver. The network will also carry out business tasks such as invoicing, stock control — feed/consumables — general ledger and payroll.

Bright way to bridge that technology gap

• *Richard Freemantle is general manager of Network Solutions Australia Pty Limited.*

(Continued from page 9)

table. This "learned" table is then used for filtering and forwarding.

The OSI layer three defines the Network; rules are defined to interconnect networks (Lans are a subset of general networks) to form an internet. In particular, network addresses such as IP are used to distinguish one Lan from another. Lans connected by a router are physically and logically separated whereas Lans connected by a bridge are physically different but logically the same (they share the same network address).

The network layer also defines the rules for passing routing information and making routing decisions (the requirement for internetworking and routing protocol such as XNS's IDP and Rip).

Each network device wanting to use a router must use the same internet protocol and explicity address the router to forward any internet packets. A router simply forwards any incoming packets but does not monitor or filter traffic. Routers can be used to build an internet with a complex network topology containing many Lans with multiple communication paths and loops.

Each network or LSN within an internet can support its own network management functions without interfering with others. Thus, routers are used in different applications from bridges; just as bridges are used differently from repeaters. They provide interconnection of Lans at different levels and provide different functions and capabilities.

> *Devices that offer the best combination of features are the level two OSI bridges.*

To summarise: when linking two or more Ethernet (IEEE 802.3) systems, users need to balance the sometimes conflicting objectives of cost, performance and the vendor independent nature of the equipment before reaching a decision.

The devices that offer the best combination of these features are the level two (OSI) bridges which should:

- ☐ Use Data link layer addresses for routing. This means that the devices can be used as a universal router to pass data between any two Ethernets independent of protocol. It is an ideal product for a multivendor environment where incompatible high level protocol sets such as XNS, TCP/IP, Decnet, or Lat must co-exist.
- ☐ Possess auto learning capabilities which can automatically detect and adjust to changes in network configuration. Addition and deletion of network devices can be accomplished without changing routing tables.
- ☐ Provide a generalised filtering capability which can offer more than just local traffic filtering. The bridge should permit the user to define various masks which filter out certain types or packet format.
- ☐ Provide high performance packet processing enabling the bridge to handle the loads of a fully laden Ethernet (both for host to host and terminal to host traffic) without affecting performance.

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You're always seen in the very best company! People are always talking to you non-stop.

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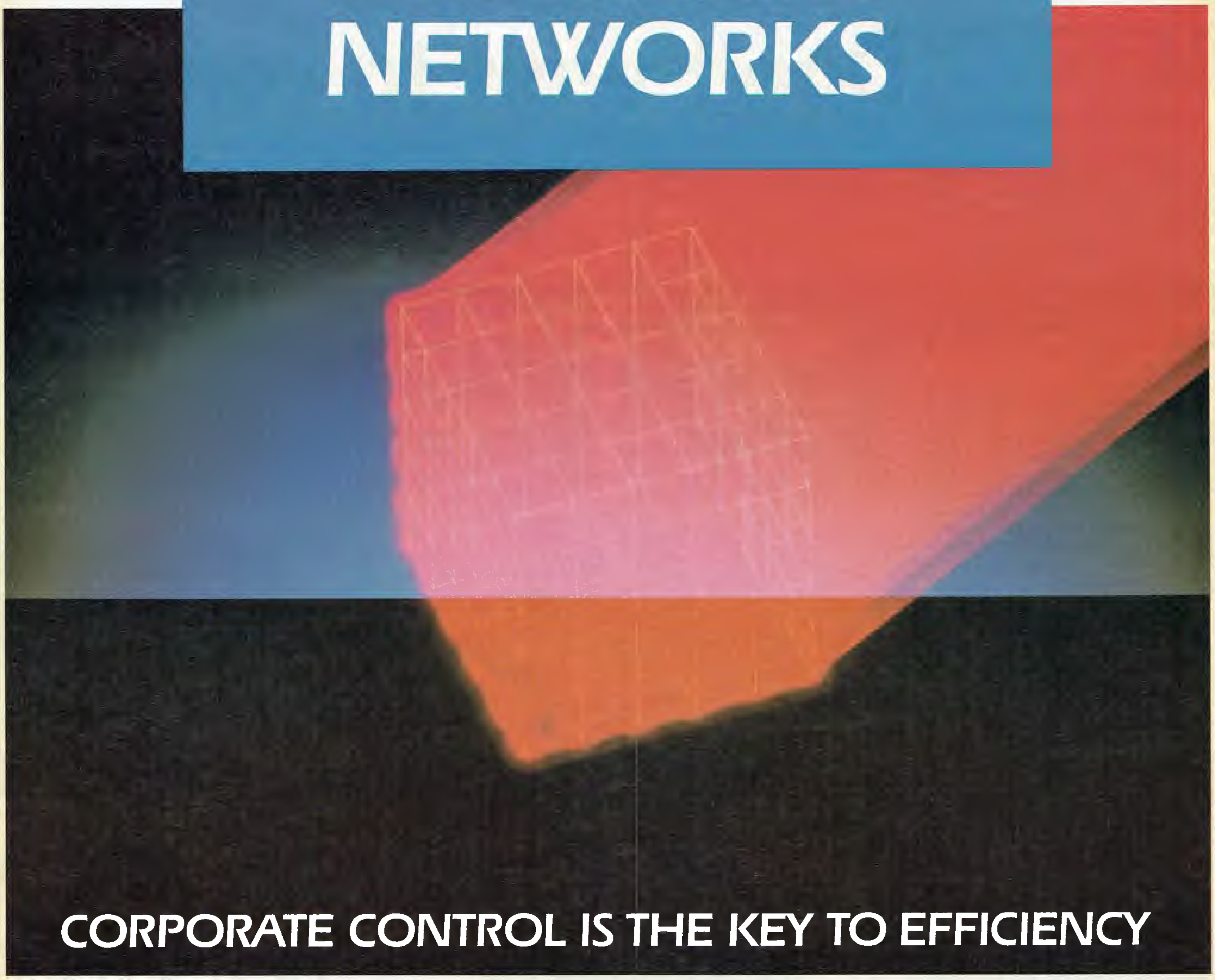
PRIVATE NETWORKS



CORPORATE CONTROL IS THE KEY TO EFFICIENCY

Modern organisations are increasingly dependent on their communications strategies to maintain their competitive position. The ability to design and manage an efficient communications network is central to your ability to control your corporate destiny.

Control and Flexibility

Control of your organisation's communications system and flexibility are key benefits of a private network. You can reconfigure your network as your organisation changes. As needs change within your organisation, a private network can be adapted much more quickly to address these needs.

Integration and Reliability

With the Scitec MAXIMA communications resources manager, you have the essential tool for building an intelligent, private communications network. Such a network can save enormous costs through the integration of disparate data and voice transmissions. But this is only half the equation. Reliability – the resilience to network failures is the other half. A communications network that is not working can be very expensive in terms of lost productivity and lost business opportunities. MAXIMA has been designed to incorporate high levels of functional redundancy and automatic trunk re-routing features to ensure maximum network up-time.

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Technical assistance with network design and planning are all part of Scitec's comprehensive support for your private network. Scitec is the only specialist communications company with offices in all mainland capital cities, and these offices are staffed with qualified engineers who can maintain your network in all conditions. Additional support is now available from our National Operations Centre (NOC) in Sydney. The NOC provides dial up fault analysis and performance evaluation on line to your network.

If you require further assistance in the planning of your private communications network, contact your local Scitec office.

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Don't wait to control th

MANAGEMENT of medium-to large-scale IBM Systems Network Architecture network demands sophisticated management tools. These tools should include the ability to collect and report on network performance data, which can help network operators in system tuning and capacity planning. IBM's Network Proformance Monitor (NPM) program was created to assist network support personnel in managing the performance and growth of SNA-based communications networks.

NPM is an online, interactive monitor and display facility that identifies network traffic bottlenecks and collects and stores network performance data.

The product provides realtime graphics and historical analysis of interactive local or remote SNA session data. The network data collection and analysis part of NPM is supported by IBM's 3705, 3725 or 3720 Communications Controllers running IBM's Advanced Communications Function/Network Control Program (ACF/NCP) Version 2, 3 or 4, using the integrated Network Performance Analyzer (NPA) data collection functions. The product can be used by network operation system programmers and network managers.

The network performance data collected by NPM can be used to monitor network traffic volumes and response times, display online or summary response time data and show network component utilisation. A file management facility enables realtime network changes to be achieved.

Logical unit

NPM is sectioned into three components: Network Data Collection and Display, Session Data Collection and Display, and TSO Graphic Subsystem.

The Network Data Collection and Display gathers information from IBM front-end processors by initiating an SNA session with a logical unit in every NCP in the net.

The information collected includes buffer utilisation, line polling or device-related statistics such as message data rates. All network data collection is handled in the NCP. When the mainframe part of NPM requests data, a virtual logical unit, called the Network Performance Logical Unit, transmits the requested counters to the mainframe.

Additional monitoring facilities can be called to produce alert messages when utilisation exceeds specified thresholds.

The Session Data Collection and Display collects three types of data: Host Transit Time Data, Network Transit Time Data and Operator Transit Time Data. The data is stored in selected files and is available for analysis and online display. Users can tailor the product for certain types and amounts of data.

Finally, the Graphic Subsystem accesses session data files and graphically presents performance data. The product contains realtime monitors that present color displays indicating current performance data in pie and bar-coded charts. This facility operates in the TSO environment and works with the Graphics Data Display Manager.

For NPM to obtain the timing values needed to make transit-time calculations, it inspects the Vtam buffer trace for every path information unit (PIU) that passes through the routine. The intercept routine looks at PIUs with First-in-Chain or Only-in-Chain data flow control indicators. The time stamps associated with these PIU's are used to calculate the transit times.

The sequence of events for transit-time calculation is as follows. After a terminal user inputs data and depresses the Enter, Clear or PF key, the controller transmits the data to Vtam. The arrival time of the inbound PIU is captured and the PIU is given to the application program. The application program builds one or more out-bound PIUs to be transmitted to the terminal.

Vtam intercepts the outbound PIUs, and the time for the first outbound PIU marks point T2. The outbound PIUs are routed back to the terminal. When the outbound PIUs are received by the terminal, the PIU with the definite-response indicator sends the information back to the host. Vtam receives and traces this response PIU and the NPM intercept routine marks this time as T3.

The Host transit time, T2 minus T1, is the time spent inside the mainframe processor, and the data consists of the number of PIU's and PIU character counts for all terminals with session collection set active.

Network transit time, T3 minus T2, can be collected for terminals that are in session with non-TSO applications and for which SNA definite-response protocol is requested. For Binary Synchronous Communications terminals, the SNA definite response is simulated by the acknowledge data-link command.

Operator transit time, T3 minus T1, is the sum of host transit time and network transit time and estimates enduser response time.

NPM uses definite response time as the approximation of the inbound PIU time to estimate the network transit time. Users should be aware of limitations to this approach.

IBM's Network Performance Monitor (NPM) uses definite-response time as the approximation of the inbound path information unit (PIU) time to estimate network transit time. Users need to be aware of the limitations of this approach.

One limitation is that NPM can only measure transit times for logical units that are in session with applications running in the same Vtam mainframe that is also running NPM. A second limitation is that network transit time is not valid if an interactive terminal logical unit transmits large inbound PIUs to the application. The NPM design and use of definite-response approximation causes network transit times to be low. For this reason, NPM is not used for application-to-application program network transit-time calculation.

Third, Systems Network Architecture

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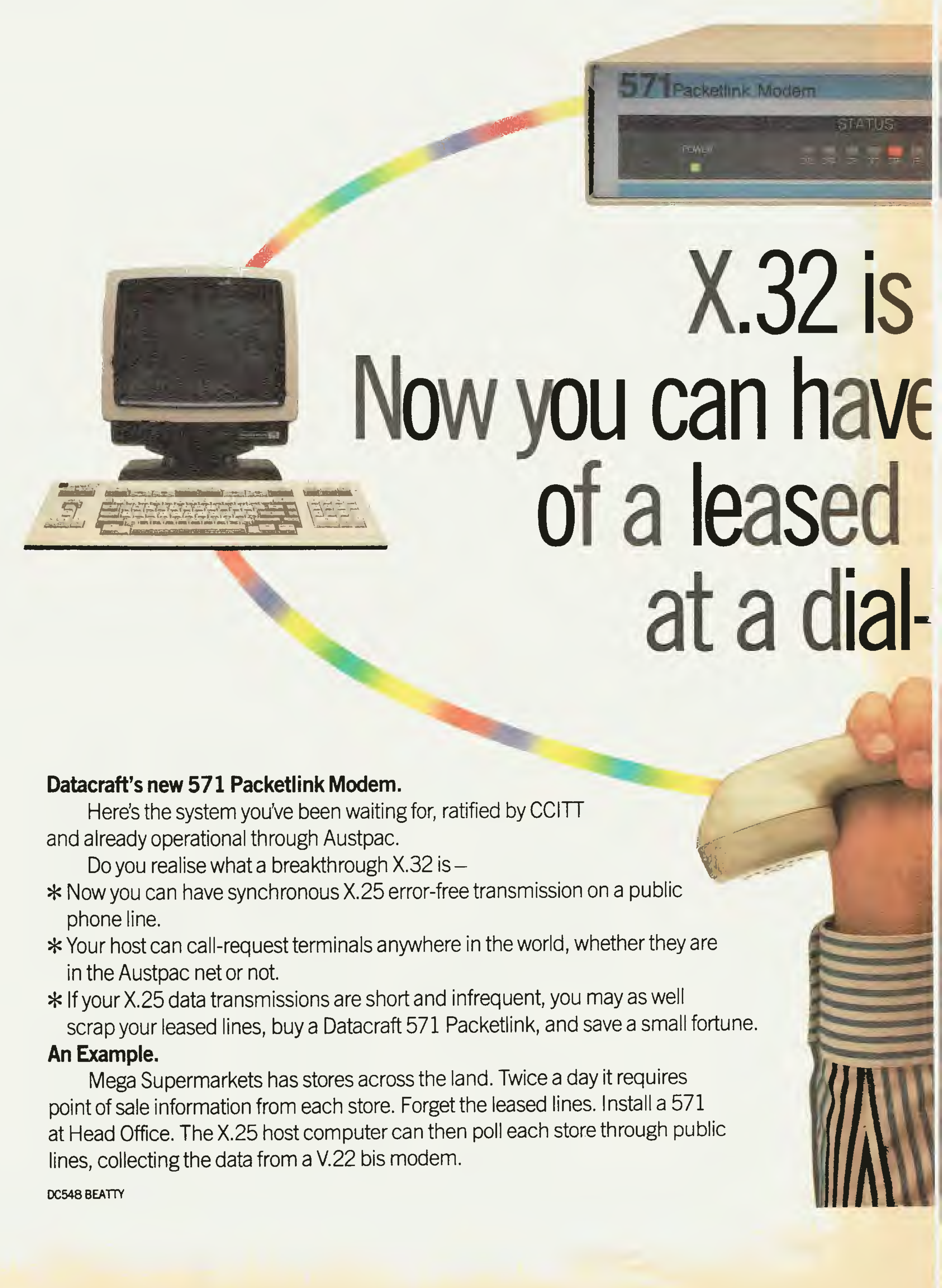

Datacraft's new 571 Packetlink Modem.

Here's the system you've been waiting for, ratified by CCITT and already operational through Austpac.

Do you realise what a breakthrough X.32 is –

* Now you can have synchronous X.25 error-free transmission on a public phone line.

* Your host can call-request terminals anywhere in the world, whether they are in the Austpac net or not.

* If your X.25 data transmissions are short and infrequent, you may as well scrap your leased lines, buy a Datacraft 571 Packetlink, and save a small fortune.

An Example.

Mega Supermarkets has stores across the land. Twice a day it requires point of sale information from each store. Forget the leased lines. Install a 571 at Head Office. The X.25 host computer can then poll each store through public lines, collecting the data from a V.22 bis modem.

DC548 BEATTY

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urce managers and applications (CICS-
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tional processing in managing TSO's in-
al address space.
hese limitations underscore the purpose
.PM, which is to measure the perfor-
ıce of interactive SNA sessions. There-
, any users expecting NPM to measure program-to-program sessions rather than interactive SNA sessions, must look to other system components to meet those objectives.

For example, IBM's CICS has built-in performance and statistical facilities relating to the CICS environment. CICS capabilities include an External Throughput Rate (ETR), which is the total number of CICS transactions processed through the system per second. Also included is CPU Time, which measures the elapsed time a processor was not in the wait state. CICS Response Time is the elapsed time between attaching and detaching CICS tasks.

NPM is just one piece of IBM's network management strategy. Netview's session trace facility, Network Logical Data Manager (NLDM), is used to acquire data from the IBM 3174 or 3274 (3X74) Response Time Monitor (RTM) feature. Response time is calculated for each terminal attached to an RTM-supported 3X74. For RTM data to be collected, Netview's NLDM must be running in the mainframe that owns the cluster control unit.

Howard Bernstein assesses tools for monitoring and control of SNA network performance. The emphasis is on bottom-line business savings through efficiency

RTM response data is maintained in a set of counters in the 3X74. The data collection process can be solicited from the controller by a Netview operator command. When a session ends, all of the accumulated RTM data is automatically sent to NLDM and stored in its database. The NLDM operator can analyse the data by viewing various bar chart screens that show a summary of response times, the trend of response times measured against predefined objectives and the response times measured on a session basis.

The system programmer responsible for NLDM can decide to record NLDM data to the external system log, called the System Management Facility (SMF) log. The SMF facility is a standard IBM MVS operating system feature that collects system and job-related information for analysis. If the SMF logging facility of NLDM is selected, NLDM will write session information records to SMF only for those sessions specifying the capture of session awareness data.

The SMF/RTM records created by NLDM are copied to the NPM buffers that are also in the common operating system storage. Once the records are copied, NPM reformats the SMF/RTM record into an NPM Session Record, which is then written into the NPM session file.

In addition, summary session records by NCP, line, physical unit and application are also written to the NPM file. The records may now be viewed by the NPM operator using the NPM Online Analysis or the NPM Graphic Subsystem.

Third parties

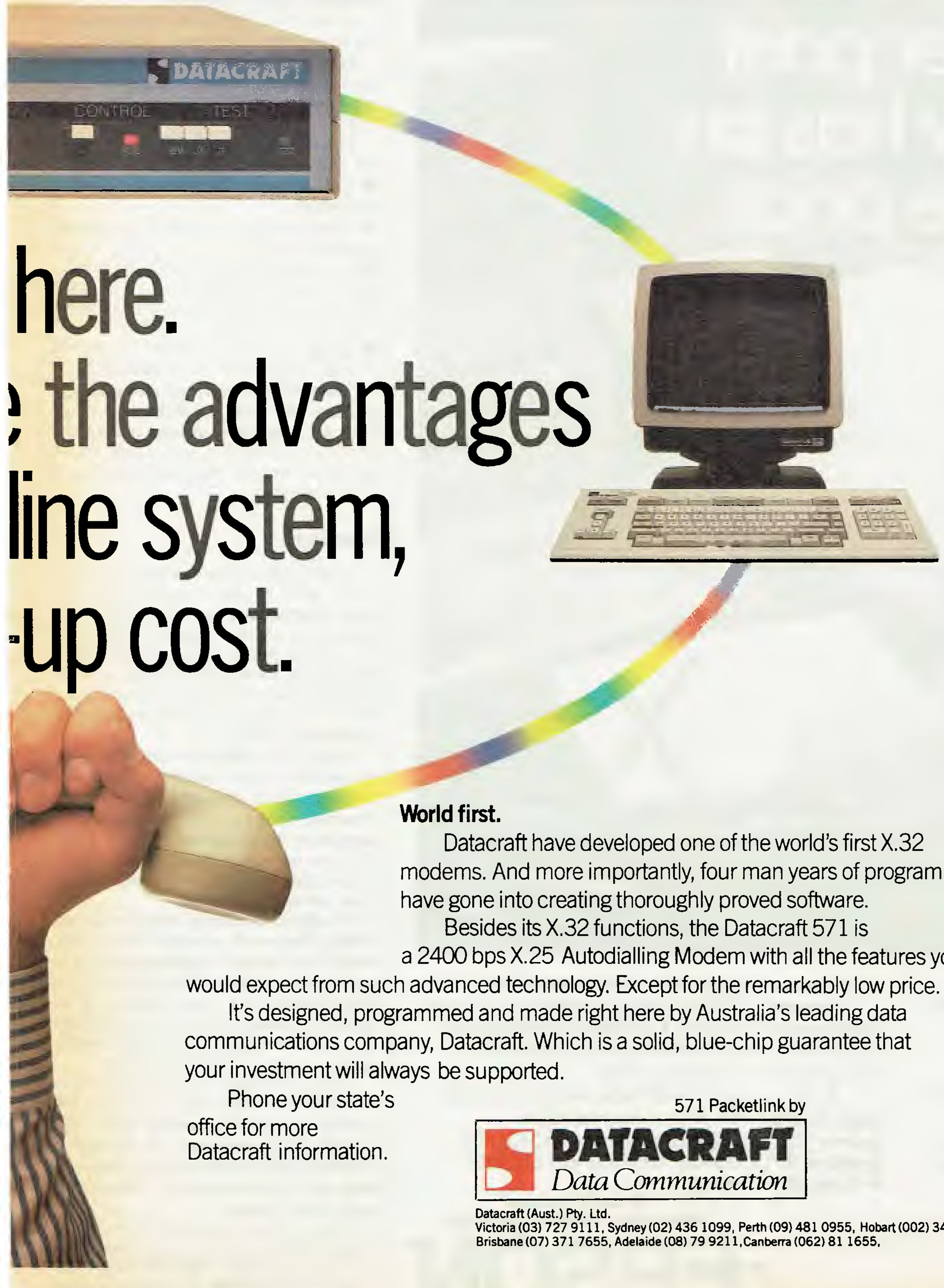
Although NPM is an integral part of IBM's total Communications Network Management (CNM) strategy, network managers looking for performance monitoring tools are not limited to IBM's NPM. Third-party vendors, such as Tesdata Systems Corp; have entered the performance monitoring market. The customer now has a choice, but must understand the various options

The following list suggests some product capability questions to ask the vendor. If a response time is reported, are other users being affected? In such cases, other questions emerge. Are they using the same network components? Are they in session with the same application? Is the response time problem related to the application or the network? Do performance alerts or monitors give indications of load versus network capacity problems? If so, do they relate to the current response time problem?

Does the product provide frequency of transactions from a particular set of users? Does the product indicate what capacity a network component must have to handle new or changing loads? How many devices will be necessary to handle the new load? What is the relationship between response time, load and component capacity for my network? What is the average transaction size and transaction time for a line, physical unit, virtual route, application and a list of logical units, to assist in capacity planning?

It is important to recognise that network management involves much more than just analysing and solving network component failures. The dominant concern behind the use of products like NPM is the potential dollar savings that can be achieved by increasing network efficiency.

- *Howard Bernstein is editor of a monthly newsletter published by Communications Solutions.*



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Heading for that perfect . . .

The computer industry is almost as fluid as the corporate sector with mergers buyouts, takeovers almost daily. Rob Slattery offers managers a few handy tips

THE next 6-12 months will see all levels of corporate computing requirements increase or alter significantly, especially where there are multiple sites, floors or types of equipment.

The role of the corporate DP/MIS manager is changing rapidly now with major equipment suppliers advocating PC-based solutions, supermicros, Lans, Wans, Network Servers, all to make systems go faster, store more and do more.

How does the manager assist the strategists and financiers within the organisation when it comes to corporate networks? An obvious answer is to know the alternatives — but this is a full-time task in itself.

The computer industry is almost as fluid as the corporate sector with mergers, buyouts, takeovers and releases occurring almost daily. Recent movements and product announcements from the computer industry have not made the manager's role any simpler either. This can sometimes lead to DP managers opting for the simpler solution of expanding their already overtaxed system thus impacting it (and their budgets) further.

A commonly held belief that personal computers will be the answer to the manager's prayers, with some analysts predicting that "there will be one PC for every two workers in Australia by 1990", may only be optimistic conjecture on the part of some suppliers, but PCs are now legitimate in the office.

However, there is a trend in larger institutions to "bar" the PC user groups from access to mainframe files and services. This exacerbates an already difficult situation causing groups within these organisations to find short term solutions to specific problems.

Lateral thinking at the strategic level as to corporate computing goals would provide a structured corporate view and purchasing plan. This would enable companies to control costs, installation times and system growth, thus increasing efficiency.

The introduction of steering committees with department heads as their members is not only a very good way of ensuring that an overall view is reached, but also allows for specific studies to be made of alternative vendor equipment.

Is the ISO/OSI Model relevant to today's corporate computing climate?

In terms of connectivity and internetworking of multiple systems the answer has to be a resounding YES! But where does it fit?

Connectivity is normally taken to mean the attachment of:

- a PC to a mini or mainframe (terminal emulation)
- a group of like or unlike PCs/Devices together (Lan)
- a group of devices (PCs hosts and other) together (Wan)
- a mini or mainframe to another (host to host)
- group of PCs to mini/mainframe through a dedicated PC (gateway)

Some of the more fragmented solutions on the market address certain elements of the total network/communications/connectivity problem, but none offers a simple consistent solution to all the problems of multiple sharing.

Barriers

Small Lans and some small multi-user boxes (such as the Televideo PM 16), made specifically to handle group sharing, provide the physical connection between PCs and the resources they need to share disk storage, printers and backup. In some instances this is a perfect corporate solution — providing the system requirement is relatively limited.

Large Lans satisfy the complicated interconnection requirements for larger corporations and government agencies. However, none provides facilities to help users locate the resources they need on the corporate network, a global naming system or the capability to access, move and use these resources easily.

It is difficult to improve products without making them overly expensive or complex. Vendors are trying to develop products to meet multiple needs, (IBM and the Token Ring Network, is a good example of attempted multilevel connectivity), but these are largely hardware solutions to what is predominantly a software problem.

Existing networks have increased our awareness of the benefits of, and need for, sharing information among users and devices. Yet a mountain of communications problems remain before users can enjoy the exchange of data "uninhibited" by technical barriers.

Virtual networking systems provide a comprehensive solution to the communication/connectivity needs of most networked system users. At the same time, these systems provide users with a consistent interface into their computing environment.

At last, laser print technology has an affordable price.
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The new Epson GQ3500 laser printer is here.

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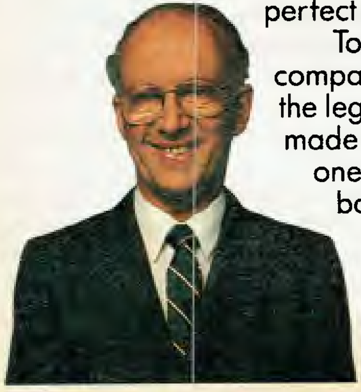


corporate solution

Traditionally users have shared large centralised systems to realise economies of scale. Now, due to intense competition among suppliers, each user can inexpensively be given a PC. By connecting PCs with a Lan and decentralising resources into dedicated "servers" highly functional distributed systems can be built which allow PCs to communicate economically with shared resources, share files and provide electronic mail.

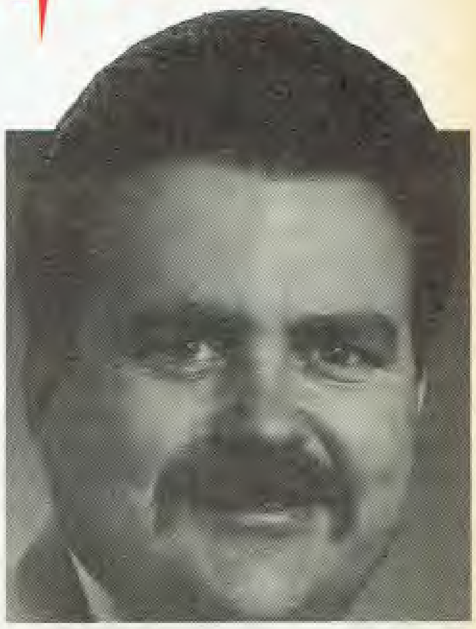
These systems provide the multi-user functionality of the mini/mainframe environment with the desktop power and simplicity of the PC.

A simple virtual network would have one server handling three to twelve PCs. As more PCs are added, the server's storage capacity can be expanded, with even larger numbers of PCs being supported by using multiple servers, each handling a group of PCs.

Multiple Lans can be used to increase the system's function and communications bandwidth. Network servers can be connected using public data networks or telephone lines so that offices around the country can share information as easily as offices down the hall.

Network servers should support a number of Lans concurrently as well as multiple communication links.

Network Servers should enable connection into existing mini and mainframe systems allowing PC users to run existing applications on hosts and access host data, with the server handling all the complex communications protocols, concurrently providing this access to multiple PCs.



- *Rob Slattery is managing director of Corpnet consultants.*

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If you want to maximize your recent investment in a System/36 or System/38 model upgrade you should be maximizing your computer's memory capacity. Because without sufficient memory your new processor's ability to perform more jobs and handle more information will go to waste.

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It's not often that you can make a decision both your management and users will thank you for. But with an EMC memory upgrade you get a performance improvement your users will love. Add in the 25 percent savings you realize on every upgrade and you'll also have a bottom line your management can't help but notice. Just ask any one of our thousands of customers.

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EMC²
The System Enhancement Company.

Until recently office automation systems lacked a viable means of communicating with the outside

A window of opportunity in the office

ASK any computer user about use of office automation and its gateway capability to public networks and you will probably get a bored look and some mumbled, comment about it being too trendy, too difficult or no one wants to use it anyway! This may all change as new advances in gateways to network services make for cheaper and more integrated communications.

Now familiar concepts of document preparation, time management and diary systems, together with electronic mail have been touted across the globe by many vendors for a number of years. What they lacked until recently is a viable means of communicating with the outside world.

This introspective tendency has been largely forced by the lack of network services available from public utilities (Telecom); but is set to change with the introduction of a new suite of products ranging from Keylink (replacing Minerva and Telememo) through to the ISDN network standards.

Many computer vendors have developed highly sophisticated office automation systems but have only recently been able to connect these systems easily into the public network. This occasioned

Tandem announces

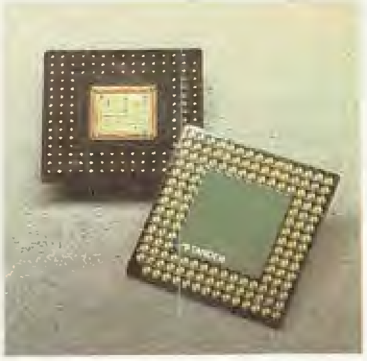
They're the newest systems in the world's

NonStop CLX.™

Distributed processing at low cost.

ONE SYSTEM, FOUR SIZES.
The CLX can run a fully distributed network. You can start with a single-processor system ideal for small applications. You can expand to two, four and six-processor systems, with over 10 gigabytes of memory, enough for over 300 users at each node in the network.

ADVANCED COMPONENTS, FEWER PARTS.



Our custom CMOS chip design delivers more performance on less power and requires less space. So does everything else. Our single-processor system operates with only two boards. The processor board consolidates over 1,000 integrated circuits in a six-chip set and comes with 4 megabytes of memory. A single integrated controller board supports disk, tape, communications and remote maintenance.

EASY MAINTENANCE, REMOTE DIAGNOSTICS.
Special software does all the work. So you can maintain it yourself, let us do it, or we can do it cooperatively. All critical components can be serviced without tools by any office worker. They can be easily replaced without interrupting the application. That means fewer service calls that take less time. And other software allows remote diagnostics from Tandem service centers.

ONE SOFTWARE FITS ALL.
Tandem's unique, parallel architecture turns all systems into one system. This top-to-bottom compatibility means you can change the size of the system without ever changing application software.

INTRODUCING NonStop SQL.™
Tandem has now combined SQL productivity and high-performance OLTP in a relational database management system. Users can read, write and update data anywhere in the Tandem network with total confidence in its integrity. And they have local database autonomy so that local processing continues when other parts of the database in the network are unavailable.

Only the beginning.

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world. That is all changing writes Mike France.

the need to have "special" gateways implemented for a specific purpose, say X.25, as one large (IBM user) Rozelle-based air conditioning firm was at pains, in a recent popular computer press article, to point out. At some point there must be a trade off between flexibility of usage and proprietary design of application interfaces.

To make full use of these emerging services, vendors need to be able to present complete networking solutions or at least hassle-free integration of additional services to existing applications. In the past, the development of such facilities has been thwarted by the lack of stability in communications standards. Not until the past few years has some level of international agreement been reached in the Session and Transport Layers of the ISO Open Systems Interconnection.

Many European companies, including ICL, are providing such facilities as a complete and integral part of the applications, not as an afterthought. This has been achieved by acknowledgement that the session and lower OSI standards are now reasonably stable.

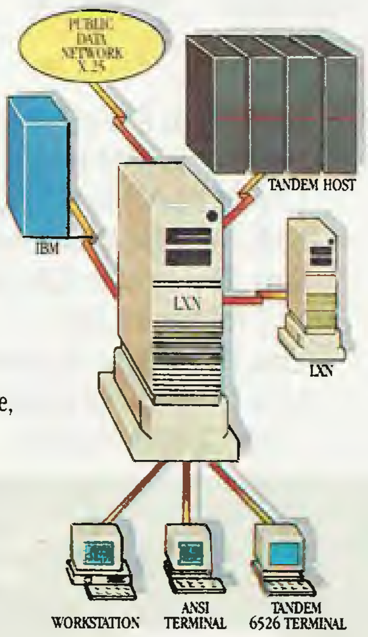
As a parallel, but "more openly compatible" opponent to proprietary Network Architectures, some European vendors have formed the X/OPEN Group to create a more free and open market. The shared objective is to establish a Common Applications Environment, where applications written in this environment will be portable at the source code level to a variety of machines.

As if this were not enough of an assault on proprietary "lock-ins", one manufacturer, ICL, has used the OSI communications standards to form the basis for its Information Processing Architecture (IPA) and is the backbone of its Networked Product Line (much like a "more compatible equivalent" of IBM's SNA).

IPA provides facilities to support interworking over the whole spectrum of network structures, allowing an organisation to choose a configuration of resources

(Continued page 18)

● *Mike France is network marketing manager with ICL Australia Pty Ltd.*



our smallest systems.
most powerful transaction network.

LXN.™

Our lowest-cost system integrates UNIX™ into the Tandem OLTP network.

GOOD CONNECTIONS.

The LXN system integrates easily into the Tandem transaction processing network. You can access both Tandem host applications and UNIX applications, as well as other hosts through SNA or X.25. You can connect PCs to LXN through Ethernet LANs, then LXN to other systems. A MS-DOS file server provides availability benefits of LXN to PC users.

HIGH AVAILABILITY.

Tandem is the first to bring OLTP features to UNIX systems in this price range. The system can support two mirrored disks. If one fails, the other takes over. In case of power failure, an uninterruptable power supply will run the entire system for up to five minutes. It will also send everything in memory to disk. When power is restored, auto restart resumes where you left off, maintaining data integrity.

APPLICATION POWER AND PORTABILITY.

Now you can run your off-the-shelf UNIX applications and access the Tandem OLTP network—all from one workstation. The power comes from a 32-bit microprocessor. It's backed by a 1.6 megabyte floppy disk drive, an 80 or 170-megabyte hard-disk storage, and a 60-megabyte streaming cartridge tape drive.

EASY TO EXPAND.

As you add users, add processor and memory boards. In a fully configured system, memory can expand to 16 megabytes, with 510 more megabytes of hard disk storage. LXN can support up to 32 users and take a huge workload off your mini or mainframe.

EASY TO SERVICE.

A menu-run test allows office workers to check out the entire system. All key components are field replaceable. Diagnostics can be run locally or remotely from a Tandem service center.

EXTEND YOUR TANDEM NETWORK.
OR START ONE.

Now it's easily affordable. Tandem systems are at work in finance, manufacturing, telecommunications, retailing, transportation, energy and government.

Small, low-cost systems are big in Tandem's future.

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NCATC/54

(Continued from page 17)

Balance of advantages to suit your needs

which offers the balance of advantages to suit its needs. This balance may extend from a highly centralised system to a highly distributed system or any point in between; thus allowing the use of IPA facilities over the basic types of physical network, wide area network or local area network.

This would appear to be a large claim at first appearances, and involves all hardware and software components being able to interconnect and interwork. Since different types of standards are needed for different types of components, then a range of standards is required to develop a framework around which one can build a structure. This structure has been developed by ICL into its network product line using OSI compatible standards in its IPA. The benefit of this approach is that, as products are developed, they may be easily integrated into the network architecture, since all the building blocks are available.

It is also apparent that such a network architecture simplifies its design use and management.

To the user, IPA provides facilities for a wide range of distributed enduser applications. These include File Transfer Facility (for copying files from one system to another), remote session access (a terminal on one system can access an application on another remote system), electronic mail, community management (network system wide task management system), distributed transaction processing, and interprogram communication. A subset of the complete range is available on each range of ICL equipment (VME/39 or VME/2900, System 25, DRS, Clan or Quattro) and would be enhanced to take advantage of changes in technology and the OSI standards.

In a centralised transaction processing (TP) system, application defined messages associated with single transaction or item of work are input from terminals to the TP service and passed on to the appropriate TP application for processing. Messages are returned to users in response to their input in time to allow intervention at the terminal site. This type of system suffers from all of the known disadvantages under heavy load conditions.

In an IPA Distributed Transaction Processing environment, input messages are routed to different applications in the same subnetwork or different applications in other subnetworks within the community. Thus an application, upon receipt of a message, can generate and send further messages to other applications. This allows for a greater range of transaction types, and use of three IPA facilities in the implementation; Distributed Message Routing (DMR), Distributed Applications Facility (Daf) and Cross Range Transaction Processing (Cross Range TP).

DMR is provided by the TP software and routes messages individually around a TP system. It provides routing according to message type, message content and the source of the message. Daf allows application programs to communicate with each other, whether they are in the same system or in different interconnected systems. This allows for distribution of transaction processing among different applications programs within the system. Cross Range TP is an IPA standard applicable to a number of regimes and ensures users have a consistent interface between their TP applications and the TP software, thus producing a portable software applications across regimes of hardware.

To achieve all of these functions, IPA depends heavily on the generalised functions of telecommunications, interworking and network management. Telecommunications involves the use of the lowest four levels of the OSI model (Physical, Data Link, Network and Transport). To fully interwork, systems must use levels 5 to 7 of the OSI model (Session, Presentation and Application). In addition to being able to connect and interwork with other OSI standard architectures, NPL components must be able to connect to non-OSI architectures. These can be other vendors' proprietary architectures (such as IBM SNA), or complete text handling services (Telecom's Viatel). The connection between OSI standard and non-OSI architectures is implemented using gateways, which perform all the boundary functions.

Building blocks

As an example of an application using public utility services, ICL has developed ICLmail based on CCITT X.400 standards. An easy interchange of mail is available and will interwork with other vendors products which conform to these standards.

The building blocks of ICL's system are the Networked Product Line of hardware and software products. The NPL architecture encompasses the whole range of computer types and associated systems, allowing interconnection of devices producing information processing and networked communication, including voice, text, image and video through the use of standards. Full transportability and upward compatibility are maintained throughout a product regime. Thus a user may easily expand their network with few changes to existing equipment and applications.

Network components fall into categories; terminals and workstations, protocol converters, modems, PABX, communications controllers, X.25 Pads, gateways, host computers and software development and maintenance tools. These components can be used in combination to form an IPA community to modify a solution for a specific user requirement. The net result is a greater range of alternatives for the enduser.

The impact of this large, compatible range of alternatives is emerging as new and refreshing in an otherwise cluttered, untidy marketplace, dominated by proprietary architectures. It allows the user to implement the most cost effective network available without fear of compromising on flexibility and compatibility.

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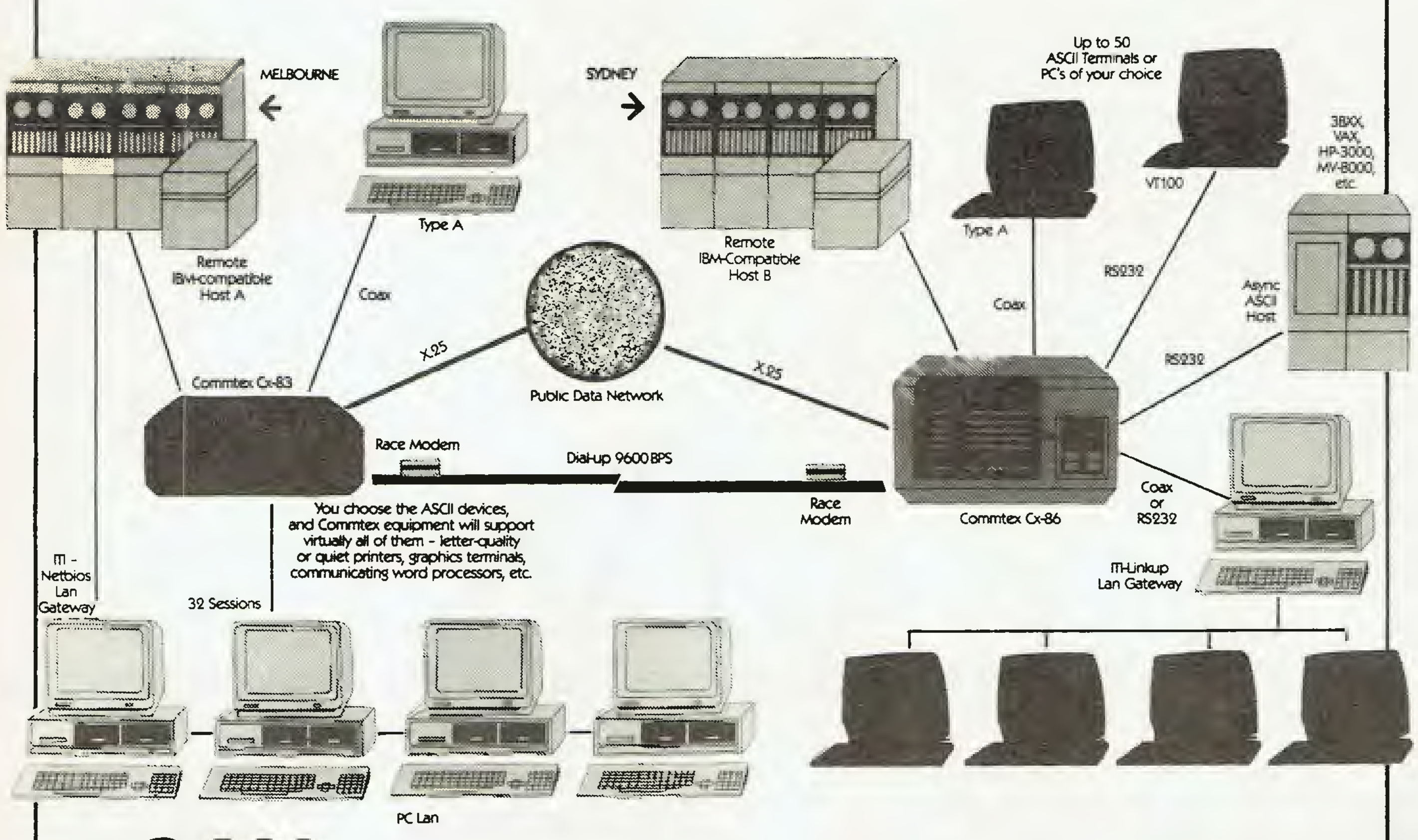

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PRODUCT FILE

SPOTLIGHT ON MODEMS

compiled by
Gillian Sidebottom

AUSTRALIA has emerged as one of the major forces in the world market for modems. The large number of products now available and the wide range of features offered in a single package are a reflection of increasingly accessible communications and microchip technology, and the boom in personal computer workstation penetration at all levels of business.

It is evident that users in all sectors of the market are now making increasingly stringent demands on their modems in terms of speed, quality and overall performance. Recent trends indicate a swing towards faster modems (2400 bits/sec), as against the 300 bits/sec models which were predominant a few years ago.

The fourth-generation products now emerging offer much faster transmission speeds, up to 9600 bits/sec, greater flexibility, and vastly improved control over data communications transmission.

The market is split between two main segments: the hobbyist and professional users. In the recent past, growth in volumes sold has been more dramatic for the lowend consumer market, where high-quality performance, speed and associated levels of service are perceived to be relatively unimportant.

Percentage growth rates for the "professional" market, where a total solutions approach to improving and expanding corporate communications capabilities is paramount, have been less dramatic but nevertheless significant.

As the technology has become cheaper and more easily accessible, the level of user support and consultancy offered by equipment suppliers as part of a complete package is now regarded by the major vendors, and perceived by serious users, to be a dominant issue often justifying higher prices for mid/top range modems.

Although labor-intensive, fast and reliable user service is increasingly gaining recognition as one of the most important selling points, alongside Telcom approval and full compliance with CCITT vendor standards. Sophisticated users of modems, whose businesses are likely to depend to a large extent on the effectiveness of data communications links, simply cannot afford to have these links out of action for even short periods of time.

The trend towards faster and more sophisticated modems looks set to continue into the future. Already, the VLSI (very large scale integration)-based products of a couple of years ago are being superseded by more intelligent and faster models.

Steve Deadman of Data Bridge, a corporate communications specialist and a major contender in the Australian market for modems, takes the view that technological developments in the near future will bring such high-speed equipment within the budgets of many major users, establishing 9600 bits/sec modems as standard in range of market sectors.

At the same time, the relatively simple configured 300 bits/sec models of yesteryear will gradually be eased out of the market, except where speed and sophistication are of virtually no value to the user. Such increases in transmission capabilities will pave the way for the introduction of even more advanced technology which already exists, but awaits official CCITT recognition.

A little further into the future, full implementation of ISDN (Integrated Subscriber Digital Network) by Telecom, which promises to bring data communications links into the home, looks set to change the face of the modem as we know it.

Key: A-Asynchronous, S-Synchronous, HDX-Half Duplex, ADX-Adaptive Duplex, Opt-Optional, An-Analogue Loopback, D-Digital Loopback, P.O.A.-Price on Application, ✓-Feature available, X-Feature not available, —Information not supplied or not applicable.
The information contained in this chart is based on information obtained from a survey of Modems Vendors/Suppliers conducted between May 18 and June 16, 1987. Details of products should be checked with the respective companies as listed.

		Transmission Compatibility				Modem Features																	
	Product Model/Manufacturer	Speed bits per second	Asynchronous/synchronous	CCITT	Bell	Full Duplex	Auto Answer	Auto disconnect	Auto Dial	Auto Ranging	Error Correction	Self-test	Remote Diagnostics	Analogue Digital Loopback	Help cues	Software Included	Inbuilt memory (No. of char.)	Internal/External	Power Supply Included	Cable Included	Documentation	Warranty	Price ($A inc tax)
J N Aimgren Pty Ltd — 16 Smith St, Chatswood, NSW 2067.																							**Tel: (02) 406 6177**
High-speed Dial and Leased Line Modems	Codex 2683	1200-19,200	A/S	V.24, V.28	—	HDX	—	—	—	—	✓	✓	✓	An/D	—	—	—	E/I	✓	✓	✓	90 days	P.O.A.
	Codex 2366	To 14,400	S	V.33 V.29	—	HDX	—	—	—	—	✓	✓	✓	An/D	—	—	—	E/I	—	—	—	90 days	P.O.A.
	Codex 2345	9600/7200/4800	A/S	V.29, V.27 bis	—	HDX	—	—	—	—	✓	✓	✓	An/D	—	—	—	E/I	—	—	—	90 days	P.O.A.
	Codex 2325	2400/4800	A/S	V.27 bis, V.29	—	HDX	—	—	—	—	✓	✓	✓	An/D	—	—	—	E/I	—	—	—	90 days	P.O.A.
	Codex 2265	9600-4800	A/S	V.32	—	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	—	—	E/I	—	—	—	90 days	$5050
	Codex 2255	4800	A/S	V.32	—	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	—	—	E/I	✓	✓	✓	90 days	$5187
Medium Speed Dial and Leased Line Modems	AX1400	2400/1200/1200-75, 0-300	A/S	V.22 bis, V.22, V.23, V.21	—	HDX	✓	✓	✓	✓	✓	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$1300.00
	AS472A	2400/1200	A/S	V.22 bis, V.22	212	✓	✓	✓	✓	✓	—	✓	✓	An/D	—	—	—	E/I	—	—	—	90 days	$947.00
	AS472	2400/1200	A/S	V.22 bis, V.22	212	✓	✓	✓	—	✓	—	✓	✓	An/D	—	—	—	E/I	—	—	—	90 days	$886
	AS471	1200/1200, 1200-75, 300	A	V.23, V.21	—	HDX	✓	✓	—	—	—	✓	—	An/D	—	—	—	E/I	—	—	—	90 days	$440.00
	AS470	1200/75, 300	A	V.22, V.21	—	HDX	✓	✓	✓	—	—	✓	—	An/D	—	—	—	E/I	—	—	—	90 days	$610.00
Short distance Modems and Multiplexers	AX440	50-19,200	A/S	V.24, V.28	—	—	—	—	—	—	—	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$584.00
	AX442	48,000-72,000	A/S	V.35	—	—	—	—	—	—	—	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$1041.96
	AX450	1200-19,200	A/S	V.24, V.28	—	—	—	—	—	—	—	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$1607.40
	AX445	1200-19,200	A/S	V.24, V.28	—	—	—	—	—	—	—	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$1926.60
	AX460	1200-19,200	A/S	V.24, V.28	—	—	—	—	—	—	—	✓	✓	An/D	—	—	—	E/I	—	—	—	—	$2188.80
Case Communication Systems Ltd — 10-12 Rodborough Rd, Frenchs Forest, NSW 2086.																							**Tel: (02) 451 6655**
	Case Quattro	300-2400	A/S	V.21, V.23, V.22, V.22 bis	103/212A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2K	E/I	✓	Opt	✓	90 days	$1495.00
	RV22B	1200/2400	A/S	V.22, V.22 bis	202/212A	✓	✓	✓	x	x	x	✓	✓	✓	x	x	—	E/I	✓	Opt	✓	90 days	$684.00
	SD1222	1200	A/S	V.22	—	✓	✓	✓	x	x	x	x	x	x	x	x	—	E/I	✓	Opt	✓	90 days	$517.00
	SB2426	2400	S	V.26	—	HDX	Opt	✓	Opt	x	x	x	x	x	x	x	—	E/I	✓	Opt	✓	90 days	$1219.00
Data Bridge Electronic Communication Pty Ltd — Suite 408, Henry Lawson Business Centre, Cary St, Drummoyne, NSW 2047.																							**Tel: (02) 819 6474**
	DSP-1200	1200	A/S	V.22	212A	✓	✓	✓	✓	—	Opt	✓	CCITT V/54	CCITT V/54	✓	✓	—	E	✓	✓	✓	1 yr	$840.00
	DSP-2400	1200/2400	A/S	V.22 bis, V.22	212A	✓	✓	✓	✓	✓	Opt	✓	✓	✓	✓	✓	—	E	✓	✓	✓	1 yr	$989.00
	DSP-1230	300/1200/75	A/S	V.22, V.23, V.21	212A	✓	✓	✓	✓	✓	Opt	✓	✓	✓	✓	✓	—	E	✓	✓	✓	1 yr	$899.00
	DSP-1234	300/1200-75/1200, 2400	A/S	V.21, V.22, V.23, V.22 bis	212A	✓	✓	✓	✓	✓	Opt	✓	✓	✓	✓	✓	—	E	✓	✓	✓	1 yr	$1199.00

PRODUCT FILE

	Transmission Compatibility				Modem Features																	
Product Model/Manufacturer	Speed bits per second	Asynchronous/synchronous	CCITT	Bell	Full Duplex	Auto Answer	Auto disconnect	Auto Dial	Auto Ranging	Error Correction	Self-test	Remote Diagnostics	Analogue Digital Loopback	Help cues	Software included	Inbuilt memory (No. of char.)	Internal/External	Power Supply Included	Cable Included	Documentation	Warranty	Price ($A inc tax)
Datacraft (Australia) Pty Ltd — Maroondah Hwy, Croydon, Vic 3136.																						**Tel: (03) 727 9111**
5312AA	300, 75/1200, 1200/1200, 1200/75	A	V.21, V.23	103/202	✓	✓	✓	x	✓	x	✓	✓	D	x	x	—	E	✓	✓	✓	90 days	$501.00
5123 Trimodem	300, 75/1200, 1200, 600	A	V.21, V.22, V.23	103/212	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	✓	E	✓	✓	✓	90 days	$975.00
5234 Quad Modem	300, 75/1200, 1200, 2400	A	V.21, V.22, V.23, V.22 bis	103/212	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	✓	E	✓	✓	✓	90 days	$1102.00
5234S Quad Modem	300, 75/1200, 1200, 2400	A/S	V.21, V.22	103/212	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	✓	E	✓	✓	✓	90 days	$1245.00
Concord V22 Data Modem	1200, 600, 300	A/S	V.22	✓	✓	✓	✓	x	✓	x	✓	✓	An/D	✓	x	x	E	✓	✓	✓	90 days	$715.00
Concord V22 bis Data Modem	2400, 1200	A/S	V.22 bis	✓	✓	✓	✓	x	✓	x	✓	✓	An/D	✓	x	x	E	✓	✓	✓	90 days	$1034.00
Concord V22 bis ARQ Modem	2400, 1200	A/S	V.22 bis	✓	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	x	✓	E	✓	✓	✓	90 days	$1515.00
Concord V22 bis Autodial Modem	2400, 1200	A/S	V.22 bis	✓	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	x	—	E	✓	✓	✓	90 days	$1138
Concord V22 bis Superduplex Modem	2400, 1200	A/S	V.22 bis	Same features as above plus multiplexer																		$2299.00
Concord V32 Trellis Modem (a)	9600, 4800	S	V.32	✓	✓	✓	✓	x	✓	✓	✓	✓	An/D	✓	x	✓	E	✓	✓	✓	90 days	$5309.00
Concord V32 Trellis Modem (b)	9600, 4800 plus extra features	S	V.32	✓	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	x	✓	E	✓	✓	✓	90 days	$5928.00
241	2400, 1200m 110/300	A	V.22 bis	103/212A	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	✓	I	—	—	✓	90 days	$923.00
121	110/300, 1200	A	V.22	103/212A	HDX	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	✓	I	—	—	✓	90 days	$615.00
Dataplex Pty Ltd — 28 John Street, Lilydale, Vic 3140.																						**Tel: (03) 735 3333**
Dataplex 224.01	75/300/1200/2400	A/S	V.21, V.23, V.22, V.22 bis	103, 202, 212A	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	Opt	2K	E	✓	✓	✓	12m	$1288.00
Dataplex 224 PC	75/300/1200/2400	A/S	V.21, V.23, V.22, V.22 bis	103, 202, 212A	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	Opt	2K	I	x	✓	✓	12m	$1180.00
Datasat, 8 Lachlan St, Liverpool, NSW 2170																						**Tel: (02) 821 1622**
Datasat V1275	300, 1200/75	A	V.21, V.23	—	✓	x	x	x	x	x	x	x	x	x	Opt	x	E	✓	✓	✓	12m	$295.00
Vtex Desk Modem	300/1200	A	V.21, V.23	—	✓	✓	✓	✓	✓	x	x	x	x	✓	Opt	—	E	✓	✓	✓	12m	$450.00
Vtex Card Modem	300, 1200	A	V.21, V.23	—	✓	—	—	—	—	—	—	—	—	—	Opt	—	I	✓	✓	✓	12m	$450.00
Vtex Card Kit	300, 1200	A	V.21, V.23	—	✓	—	—	—	—	—	—	—	—	—	✓	—	I	✓	✓	✓	12m	$555.00
Netcomm (Australia) Pty Ltd — Unit B, 25 Paul St, North, North Ryde, NSW 2113.																						**Tel: (02) 888 5533**
Modem 64/128	300/300, 1200/75	A	V.21, V.23	—	✓	✓	✓	✓	✓	x	x	x	x	✓	✓	—	E	✓	✓	✓	2yrs	$341.00
Modem 3+12A	300/300, 1200/75	A	V.21, V.23	103	✓	—	—	—	—	—	✓	—	An	✓	✓	—	E	✓	✓	✓	2yrs	$341.00
Modem 3+12NCP	300/300, 1200/75	A	V.21, V.23	103	✓	—	—	—	—	—	✓	—	An	✓	✓	—	E	✓	✓	✓	2yrs	$341.00
Automodem 3+12	300/300, 1200/75	A	V.21, V.23	103	✓	—	—	✓	—	—	✓	✓	An/D	✓	✓	—	E	✓	✓	✓	2yrs	$565.00
Automodem 21/23	300/300, 1200/75, 75/1200	A	V.21, V.23	103	✓	✓	✓	✓	—	—	✓	✓	An/D	✓	Opt	50	E	✓	✓	✓	2yrs	$649.00
Automodem 12/12	300/300 (Bell only), 1200/75	A	V.22	103/212A	✓	✓	✓	✓	—	—	✓	✓	An/D	✓	Opt	50	E	✓	✓	✓	2yrs	$699.00
Automodem 24/24	300/300, (Bell only), 1200/1200, 2400/2400	A	V.22, V.22 bis	103/212A	✓	✓	✓	✓	—	—	✓	✓	An/D	✓	Opt	50	E	✓	✓	✓	2yrs	$999.00
Automodem 123	300/300, 1200/75, 75/1200, 1200/1200	A	V.21, V.23, V.22	103/212A	✓	✓	✓	✓	—	—	✓	✓	An/D	✓	Opt	50	E	✓	✓	✓	2yrs	$925.00
Automodem 1234	300/300, 1200/75, 75/1200, 1200/1200, 2400/2400	A	V.21, V.23, V.22, V.22 bis	103/212A	✓	✓	✓	✓	—	—	✓	✓	An/D	✓	Opt	50	E	✓	✓	✓	2yrs	$1125.00
Smartmodem 21/23SA	300/300, 1200/75, 75/1200, 1200 HDX	A/S	V.21, V.23	103	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	E	✓	✓	✓	2yrs	$765.00
Smartmodem 1200SA	300/300, (Bell only), 1200/1200 (2400 upgrade)	A/S	V.22 (Upgrade to V.22 bis)	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	E	✓	✓	✓	2yrs	$1058.00
Smartmodem 2400SA	300/300 (Bell only)	A/S	V.22, V22 bis	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	E	✓	✓	✓	2yrs	$1358.00
Smartmodem 123SA	300/300, 1200/75, 75/1200, 1200 HDX, 1200/1200 (2400 upgrade)	A/S	V.21, V.22, V.23 (Upgrade to 22 bis)	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	E	✓	✓	✓	2yrs	$1437.00
Smartmodem 1234SA	300/300, 1200/75, 75/1200, 1200 HDX, 1200/1200, 2400/2400	A/S	V.21, V.23, V.22, V.22 bis	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	E	✓	✓	✓	2yrs	$1733.00
Datalock 123SA	300/300, 1200/75, 75/1200, 1200 HDX, 1200/1200 (2400 upgrade)	A/S	V.21, V.23, V.22 (Upgrade to V.22 bis)	103/212A	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	✓	2K	E	✓	✓	✓	2yrs	$1505.00
Datalock 1234SA	300/300, 1200/75, 75/1200, 1200 HDX, 1200/1200, 2400/2400	A/S	V.21, V.23. V.22 V.22 bis)	103/212A	✓	✓	✓	✓	✓	✓	✓	✓	An/D	✓	✓	2K	E	✓	✓	✓	2yrs	$1836.00
PC In/Modem	300/300, 1200/75, 75/1200,	A	V.21, V.23	103	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	I	✓	✓	✓	2yrs	$615.00
In/Modem 1200	300/300 (Bell only), 1200/1200 (2400)	A	V.22, Upgrade to V.22 bis	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	I	✓	✓	✓	2yrs	$834.00
In/Modem 2400	300/300 (Bell only), 1200/1200, 2400/2400	A	V.22, V.22 bis	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	I	✓	✓	✓	2yrs	$1125.00
In/Modem 123	300/300, 1200/75, 75/1200, 1200/1200 (2400)	A	V.21, V.23, V.22 (Upgrade to V.22 bis)	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	I	✓	✓	✓	2yrs	$1140.00
In/Modem 1234	300/300, 1200/75, 75/1200, 1200/1200 2400/2400	A	V.21, V.23, V.22, V.22 bis	103/212A	✓	✓	✓	✓	✓	—	✓	✓	An/D	✓	✓	50	I	✓	✓	✓	2yrs	$1414.00
Smartmodem 9648FT	2400, 4800, 7200, 9600	S	V.27, V.29	—	HDX	✓	✓	✓	—	—	✓	✓	An/D	✓	✓	—	E	✓	✓	✓	2yrs	$3300.00
Smartmodem 9648DP	2400, 4800, 7200, 9600	S	V.27, V.29	—	HDX	✓	✓	✓	—	—	✓	✓	An/D	✓	✓	—	E	✓	✓	✓	2yrs	$2252.00
Smartmodem 9648HD	2400, 4800, 7200, 9600	S	V.27, V.29	—	HDX	✓	✓	✓	—	—	✓	—	An	✓	✓	—	E	✓	✓	✓	2yrs	$1933.00
Trailblazer	1200/1200, 2400/2400, 18,000 ADX	A	V.22, V.22 bis	212A	ADX	✓	✓	✓	✓	✓	✓	✓	—	✓	Opt	—	E	✓	✓	✓	2yrs	$3468.00
Trailblazer PC	1200/1200, 2400/2400, 18,000 ADX	A	V.22, V.22 bis	212A	ADX	✓	✓	✓	✓	✓	✓	✓	—	✓	✓	—	I	✓	✓	✓	2yrs	$3242.00

	Transmission Compatibility				Modem Features																	
Product Model/Manufacturer	Speed bits per second	Asynchronous/synchronous	CCITT	Bell	Full Duplex	Auto Answer	Auto disconnect	Auto Dial	Auto Ranging	Error Correction	Self-test	Remote Diagnostics	Analogue Digital Loopback	Help cues	Software Included	Inbuilt memory (No. of char.)	Internal/External	Power Supply Included	Cable Included	Documentation	Warranty	Price ($A inc tax)
The Nice Computer Company of Australia Pty Ltd — Suite 3, 41 Rawson St, Epping, NSW 2121.																						**Tel: (02) 869 8777**
Nice Modem 2	300FDX, 1200/75, 75/1200, 1200FDX	A	V.21, V.22, V.23	103/212	✓	✓	✓	✓	✓	x	✓	x	D	✓	x	2K	E	✓	✓	✓	12m	$749.00
Modem 3	300, 1200/75, 75/1200	A	V.21, V.23	103	✓	✓	✓	✓	✓	x	✓	x	D	✓	x	2K	E	✓	✓	✓	12m	$549.00
Inside 1	300, 1200/75, 75/1200	A	V.21, V.23	103	✓	✓	✓	✓	✓	x	✓	✓	An/D	x	✓	40K	I	x	✓	✓	12m	$599.00
Inside 2	300FDX, 1200/75, 75/1200, 1200FDX	A	V.21, V.22. V.23	103/212	✓	✓	✓	✓	✓	x	✓	✓	An/D	x	✓	40K	I	x	✓	✓	12m	$849.00
Pulsar Electronics, Catalina Drive, Tullamarine, Vic 3043.																						**Tel: (03) 330 2555**
Sam Modem	300/300, 1200/1200, 1200/75	A	V.21, V.22, V.23	—	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓	✓	32K	E	✓	✓	✓	12m	$862.00
Rosser Communications — Suite 4, 1051 Pacific Hwy, Pymble, NSW 2073.																						**Tel: (02) 449 8233**
Cunninghams CE DATA 2301	300/1275	A	V.21, V.23	—	✓	x	—	x	x	x	x	x	x	x	Opt	x	E	✓	Opt	✓	12m	$280.00
CE DATA 2123	300/1275	A (S opt)	V.21, V.23	103/202	✓	✓	✓	Opt	x	x	x	x	A	x	Opt	64	E	✓	Opt	✓	12m	$440.00
CE DATA 123AD	300/1275/1200	A/S	V.21, V.23, V.22	103/202/212A	✓	✓	✓	✓	✓	x	x	x	A	x	Opt	64	E	✓	Opt	✓	12m	$989.00
Scitec Communication Systems Ltd — 3 Apollo Place, Lane Cove, NSW 2066.																						**Tel: (02) 428 9555**
Business 2200	1200	A/S	V.22, V.25 bis	103	✓	✓	✓	✓	x	x	✓	✓	An/D	✓ V.25 bis		50 x 17 V.25 bis	E	✓	x	✓	3m	$874.00
Business 2400	1200/2400	A/S	V.22, V.22 bis, V.25, V.25 bis	212A	✓	✓	✓	✓	✓	x	✓	✓	An/D	✓ V.25 bis		50 x 17 V.25 bis	E	✓	x	✓	3m	$1472.00
Business 2123	300 75/1200, 1200HD	A	V.21, V.23, V.22HD	103	✓	✓	✓	✓	✓	x	✓	x	An	✓ V.25 bis		last no. redial	E	✓	x	✓	3m	$633.00
Business Tristar	300, 75/1200, 1200	A/S	V.21, V.23, V.22	103/212A	✓	✓	✓	✓	✓	x	✓	✓	An/D	x		x	E	✓	x	✓	3m	$1472.00
Business Olympic	300, 75/1200, 2400	A/S	V.21, V.22, V.23 V.22 bis	103/212A	✓	✓	✓	✓	✓	x	✓	✓	An/D	x		last no. redial	E	✓	x	✓	3m	$1725.00
Sendata Communications Pty Ltd — 67 Nicholson St, St Leonards, NSW 2065.																						**Tel: (02) 438 4255**
4321AD	300, 1200, 2400, 75/1200, 1200/75	A/S	V.21, V.23, V.22, V.22 bis	103/202	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8K	E	✓	✓	✓	2 yrs	$1740.00
4321INT	300, 1200, 2400, 75/1200, 1200/75	A/S	V.21, V.23, V.22, V.22 bis	103/202	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2K	I	x	✓	✓	2 yrs	$1656.00
321AD	300, 1200, 75/1200	A/S	V.21, V.23, V.22	103/202	✓	✓	✓	✓	✓	✓	x	x	x	x	✓	x	E I (Opt)	✓	✓	✓	2 yrs	$1296.00
V22AD	1200	A/S	V.22	202	✓	✓	✓	✓	x	✓	x	x	x	x	✓	x	E	✓	✓	✓	2 yrs	$1056.00
321AA	1200, 300, 75-1200	A/S	V.21, V.22, V.23	—	✓	✓	✓	x	✓	x	x	x	x	x	x	x	E	✓	✓	✓	2 yrs	$1104.00
V22 bis AD	2400, 1200	A/S	V.22, V.22 bis	—	✓	✓	✓	✓	✓	✓	x	x	✓	x	✓	x	E	✓	✓	✓	2 yrs	$1488.00
V22	1200	A/S	V.22	—	✓	✓	✓	x	x	x	x	x	x	x	x	x	E	✓	✓	✓	2 yrs	$792.00
1275INT	300, 1200/75	A	V.21, V.23	—	✓	✓	✓	✓	✓	✓	x	x	x	x	✓	x	I	x	✓	✓	2 yrs	$660.00
2000	300, 1200HD, 75/1200, 1200/75	A/S	V.21, V.23	103/202	✓	✓	✓	x	x	x	x	x	x	x	x	Opt	E	✓	✓	✓	2 yrs	$660.00
1275	300, 1200/75	A	V.21, V.23	103/202	✓	x	x	x	x	x	x	x	x	x	x	Opt	E	✓	✓	✓	2 yrs	$312.00
300M	300	A	V.21	103	✓	Opt	—	—	—	—	—	—	—	—	—	—	E	✓	x	✓	2 yrs	$240.00
700M	300, 1275, 75/1200, 1200HD	A/S	V.21, V.23	103/202	✓	—	—	—	—	—	—	—	—	—	—	—	E	—	—	✓	2 yrs	$354.00
2927	9600, 4800	S	V.29, V.27	—	✓	x	x	x	x	x	✓	x	✓	✓	x	32K	E	✓	✓	✓	2 yrs	$1800.00
Security Adapter	300-19.2K	A/S	V.21, V.23, V.22, V.22 bis	103/202	✓	x	x	✓	x	✓	x	x	x	x	x	32K	E	✓	✓	✓	2 yrs	$696.00
Sendata Guard	1200, 2400	—	V.22, V.22 bis	—	✓	x	x	✓	x	x	x	x	x	x	x	8K	E	✓	—	✓	2 yrs	$540.00
Shuttle Datacomm — 30/456 St Kilda Rd, Melbourne 3000																						**Tel: (03) 267 1011**
Cicada 312	300, 1200/75	A	V.21, V.23	—	✓	—	—	—	—	—	—	—	—	—	x	x	E	✓	x	✓	12m	$245.00
Shuttle 312AD	300, 1200/75	A	V.21, V.23	✓	✓	✓	✓	✓	—	—	—	—	—	—	x	x	E	✓	x	✓	12m	$594.00
Shuttle Volksmodem VM12	1200/1200	A	V.22	212A	✓	✓	✓	✓	—	—	—	—	—	—	x	x	E	✓	x	✓	12m	$595.00
Shuttle Express	1200/1200	A	V.22	212A	✓	✓	✓	✓	—	—	✓	—	A	—	x	480	E	✓	x	✓	12m	$890.00
Shuttle Secure 12	1200/1200	A	V.22	212A	✓	✓	✓	✓	—	—	✓	—	A	—	x	480	E	✓	x	✓	12m	$990.00
Shuttle 123	300/1200/75/1200	A	V.21, V.22, V.23	212	✓	✓	✓	✓	✓	—	✓	—	—	—	x	—	E	✓	x	✓	12m	$998.00
Shuttle Lightning 24	300/1200/2400	A	V.22 bis, V.22	212A/103/113	✓	✓	✓	✓	✓	—	—	—	—	—	x	48	E	✓	x	✓	12m	$895.00
Race I	1200/2400/4800/7200/9600	A	V.22, V.22 bis, V.27, V.29	212A/103/113	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	310	E	✓	x	✓	12m	$3250.00
Race II	1200/2400/4800/7200/9600	A	V.22, V.22 bis, V.27, V.29	212A/103/113	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	E	✓	x	✓	12m	$3700.00
Race BMX Block Mode Xcelerator	1200/2400/4800/7200/9600	A	V.22, V.22 bis, V.27, V.29	—	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	310	E	✓	x	✓	12m	$2750.00
Rally 9600 Leased Line Modem	2400/4800, 4800/9600	S	V.27, V.29	—	✓	—	—	—	—	✓	✓	✓	A	✓	x	✓	E	✓	x	✓	12m	$2500.00
Race I VM24	2400/4800, 4800/9600	A	V.22 bis, V.27, V.29	212A/103/113	✓	✓	✓	✓	✓	—	✓	✓	✓	✓	x	✓	E	✓	x	✓	12m	$3800.00
Telecorp Pty Ltd — 21 Tepok Rd, Terrey Hills, NSW 2084.																						**Tel: (02) 450 2522**
Fastcomm 96	9600	A	V.29	—	ADX	✓	—	✓	✓	✓	✓	✓	A	✓	✓	—	E/I	—	—	✓	—	$3460.00
Fastcomm Plus 2496	9600/2400/1200/300	A	V.29, V.22 bis, V.22, V.21	212A/103	ADX ✓	✓	—	✓	✓	✓	✓	✓	A/D	—	✓	—	E/I	—	—	✓	—	$4400.00

Key: A-Asynchronous, S-Synchronous, HDX-Half Duplex, ADX-Adaptive Duplex, Opt-Optional, An-Analogue Loopback, D-Digital Loopback, P.O.A -Price on Application, ✓-Feature available, X-Feature not available, —-Information not supplied or not applicable.
The information contained in this chart is based on information obtained from a survey of Modems Vendors/Suppliers conducted between May 18 and June 16, 1987. Details of products should be checked with the respective companies as listed.

Campus teaches an e-mail lesson

VICTORIA University of Wellington, New Zealand has the potential to access more than half a million people through its electronic mail system.

The university is linked to many overseas networks: Arpanet, which was based on a US Defence Department beginning; UUCP (Unix University Copy); Bitnet (Because Its There Net); Janet, (Joint Academic Network) which is funded by the UK government; the Computer Science Network (CSnet); the Australian CSnet, and the South Pacific Education and Research Net (Spearnet).

It is not possible to say how many people have access to the networks, but the figures for UUCP alone are more than 300,000 accounts (individual addresses), with the possibility of more than one person communicating through an account.

Victoria connects through Telecom's Pacnet, the international standard (CCITT X.25) hardware transmission method. This service is usually run in most countries by the Telecom organisation, except in the US where private carriers like Tymenet and Telenet are the providers.

Mike Newbery, a system programmer at Victoria, looks after the network for the university's computer centre. He said there was a mixture of hardware involved in sending electronic mail.

Discounts

Spearnet was a result of Digital Equipment Corp spreading its net throughout the universities in the South Pacific. DEC offered discounts on equipment to universities which wanted to send electronic mail to one other, Newbery said.

"We bought a Microvax through the program. It connects through Pacnet to Spearnet. We can be talking to England or Australia in less than two seconds."

To connect to UUCP, Victoria uses its computer science department's Pyramid. The mail goes to the University of Calgary in Canada, and from there links can be made through to many other networks in the US.

Mail coming in could go through the Microvax to the computer centre's IBM system, then the Pyramid for translation and back to the Microvax for distribution.

The use of the network is spreading, particularly because of the contacts made by university lecturers on exchange sabbaticals.

One staff member in the zoology department wrote a book with a colleague in the US. They are now collaborating on the second edition. Updates are sent back and forth for checking by both parties. The advantage of this is timeliness.

As well as the mail service there is Usenet, a bulletin board/conferencing facility. Victoria takes only part of the 2M-bytes of information which floods in through the network each day. Motorola, Microsoft, Intel and Apple are among those distributing information on the service.

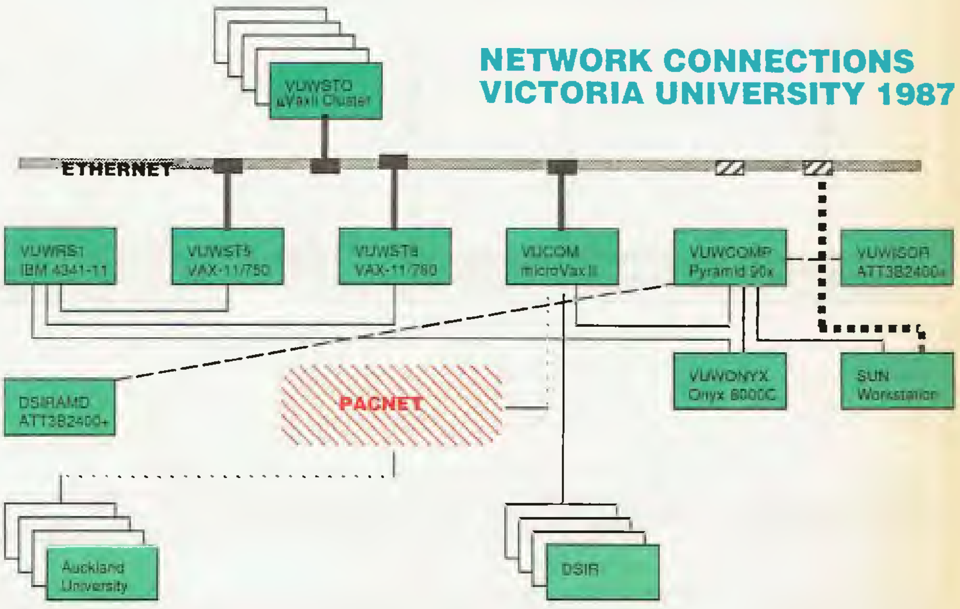
The bulletin board service once helped the university save $US5000 on a particular piece of software it needed. One of the staff saw an advertisement on Usenet indicating the product was being given away to universities. Victoria took a beta test release, helped the developer with its debugging and got the software free.

The university also makes use of electronic mail to broadcast requests for software information about new products, to get rumors about the world of computing and help for software bugs, and for colleague to colleague discussions.

Newbery said the cost of electronic mail could be justified by comparing 20 lines of information being sent. Through the postal service, 20 lines would cost 40 cents and take three days, without taking secretarial or copying time and costs into account.

Electronic mail had been costed at about 5 cents for a 20-line message. This took account of the Pacnet connection at $200 a month for a 2400-bit/sec line but did not include the amortised cost of the Microvax.

- *This article has been edited from* Computerworld New Zealand.



A New Zealand university makes imaginative use of a massive international e-mail network.

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Total control of access, from your desk.

A system of passwords controls authority and access. So the office boy can't

David Malcolm weighs up the arguments for and against PC networks

The catches in a PC net

■ ***David Malcolm . . . drawbacks***

PERSONAL computers have achieved respectability throughout the serious computer world. They are now being used for a range of management, design and clerical duties that were formerly impossible or limited to large computer resources.

But the PC has its drawbacks. As users become more experienced, their demands for interchange of data and more resources also grow. The need to manage users, to protect them from themselves and the failings of their computer, also grows. The need to link groups of PCs, under a resource and support umbrella, becomes overwhelming.

Whether your department already has a set of PCs, or is considering purchases that will lead to a set of computers, there are two routes to consider. The first is networking, tying the PCs together with a combination of software and hardware addons to provide connection and networking. The second is multi-user computers, which have the interconnection and multi-user software built in from the start.

As part of the buying strategy there are some advantages of multi-user systems, and disadvantages of PC networks, of which all buyers should be aware.

Initially, the applications of PCs required minimal security and integrity features because only one user was able to operate the system and, when finished, could remove the disks and take them away.

But matters quickly changed. Cheap processing power quickly created demand for more and larger files. The need for backup arose.

Software developers began to adapt the software to provide capability to connect additional non-intelligent workstations. PC operating systems began to generate their own overheads.

Networking arose. It was here that the real problems began because PC network architecture and file servers imposed limits on the system.

The growth of personal computing and networking resulted in three main problems:

1. The operating system cannot make use of the additional capacity without modification.
2. To be used in a network, single user software requires extensive modifications in file handling.
3. Software has to be re-adapted for each different network.

On top of that, networks are not cheap; only the more sophisticated types can provide enough throughput, and they require expensive coaxial or biaxial cabling, special interface ports, an interface card within the PC, and a modified operating system.

To make matters worse, software developers have been reluctant to adapt their operating systems, and few application development tools exist to create software for the networked environment.

In a communications environment the networked PC creates its own problems. Host connectivity will need an upgrade. Simple connections, such as to remote offices, create major problems.

Multi-user microcomputing developed at the same time as personal computers, taking advantage of the same chips. But to their advantage, the multi-user concept encouraged designers to harness the technology so that it served several users and provided mutlitasking.

The most important features that were provided were I/O processors and memory mapping hardware.

Secure environment

Superior performance is achieved by disks using I/O processors and parallel interfaces attached directly to the memory.

Hardware memory management lets programs be loaded into physically fragmented space. This provides a secure environment for programs and further savings.

Multi-user microcomputers are more reliable and easier to maintain than their equivalent networked PC system.

Multi-systems are a better platform for operating systems, offering a choice of upgrading existing microcomputing operating systems or bringing down more sophisticated products from the mini-computers and mainframes.

With an upgrade of a typical single user operating system the technical problems related to performance and to user file integrity are more readily resolved.

For the user and the installer the multiterminal microcomputer is convenient and cheap. The asynchronous terminals may be more easily linked to remote locations, such as warehouses, factories or office units.

This outline makes it clear that there is an alternative to PC nets. Obviously, there are other factors in the decision such as cost, corporate strategy, and commitment to individual suppliers.

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From initial logon, NET/MASTER works to increase productivity and police security levels. NET/MASTER tightly integrates with your current security system (ACF2 or RACF). The user is presented with authorised applications (EASINET) which, while in use, can be switched using MAI (Multiple Application Interface).

Communications can be sent in a freeform manner (NET/MAIL), broadcast instantly or stored on a bulletin board.

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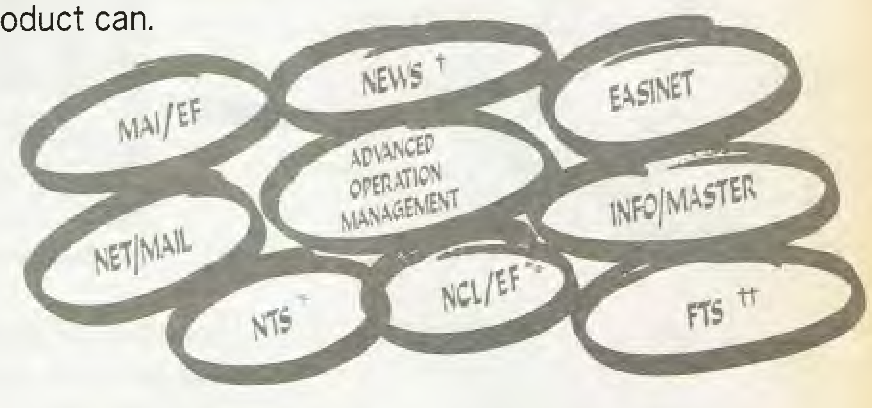

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